The Chemical Age

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Notes and Comments

Chemistry and Life

PRESIDENTIAL addresses before the British Association are generally stimulating and often profound. Those who were privileged to hear the address delivered by this year's president, Sir Frederick Gowland Hopkins, last Wednesday could not fail to be stimulated. To the scientific man engaged in industry the stimulation was greater than the profundity, although there is in the address sufficient evidence that the president, had he wished to do so, might have delved deep enough to have " lost " all but the most expert biochemists among his hearers. A presidential address before the British Association which is too deep to arouse discussion among the lay public is a wasted opportunity of interesting that same public in the doings of science. To a certain extent the British Association is the shop window of the scientific world.

The science of biochemistry with which the president's address was almost wholly concerned may be comparatively young, but may with some reason claim to be the most important science at this present juncture. The fermentation industries interest the chemical manufacturer perhaps more than any other aspect of biochemistry. Fermentation is as old as life; no man knows of a time when it can be said with certainty that man did not benefit from, and practise, fermentation; the earliest literature contains praises of the grape. Industrially, the chemistry of life is of the highest importance and is likely to become of still greater importance as the supplies of naturally occurring products become exhausted. Biochemistry, however, demands greater attention than that.

New Fields for Technicians

FROM the studies now in progress may spring new industries, perhaps not large, but highly important, because they will concern the health and existence of mankind. The story of this work is the story of a complete change of outlook that has arisen during the last twenty-two years. Sir Edward Sharpey-Schafer voiced the old view in his presidential address in 1911. He maintained that a living body was composed of but few chemical elements and that it was only necessary to find the right formula to produce life. " When the chemist succeeds in building up this compound," he said, " it will, without doubt, be found to exhibit the phenomena which we are in the habit of associating with the term ' life '." Biologists of that day appeared to hold the simple view that life required only the manufacture and maintenance of a certain unknown chemical compound. Fortunately the line of research suggested by this pronouncement did not absorb the activities of biochemists; had it done so, as Sir Frederick Gowland Hopkins justly remarks, the goal would have proved elusive.

Modern biochemistry concerns itself rather with the chemical effects of the processes of life and with the effect on those processes of the presence or absence of certain chemical bodies. From those studies there is arising a realisation of the processes of life that may confidently be expected to result in the most valuable extensions to medical science—and incidentally in a demand for new drugs and preparations which, though only required in small quantities, may entail so much difficulty in manufacture as to open new fields to skilled technicians. Another important aspect of modern biochemistry is the recognition of the modification that occurs in the observed behaviour of a cell as the result of the entry of a few molecules of a foreign substance. Three definite advances are now accepted as perhaps the greatest steps made in medical, as distinct from surgical, science in the past generation.

The Discovery of Vitamins

ONE of these advances relates to substances produced in the body temporarily and locally and by virtue of their chemical properties translating for the tissues the messages of nerves. The second advance is the recognition of substances produced continuously in specialised organs which carry chemical messages from organ to organ and which have the most profound influence upon the whole functioning of the body; these are known as the hormones. Those who were privileged to hear last winter the brilliant discourse on the hormones delivered before the London Section of the Society of Chemical Industry by Professor E. C. Dodds will realise even more vividly than from the necessarily brief account given by Sir Gowland Hopkins how minute are the quantities of hormones present but how great is their effect if absent or if present in the smallest excess. Although so small in quantity, the chemistry of the hormones is already of formidable dimensions.

Finally, there is the discovery of vitamins, a discovery which appears to have impressed popular opinion to a greater extent than anything since radium. Vitamins provide an example of the influence of small quantities of foreign substances not produced in the body but supplied from outside. Whilst these facts are of the greatest interest to all, more particularly from the medical aspect, it may perhaps be of greater interest to the chemical industry, which draws so many of its raw materials from the vegetable kingdom, to learn that substances kindred to the hormones and vitamins are probably of wide, and

perhaps of general biological distribution. The effect of this new knowledge in years to come, for example, on the growth of trees to provide wood for charcoal production when our coal supplies are failing, or for plastics, or for the manufacture of synthetic alcohol for power may be greater than can be foreseen to-day.

Science and the Future

SIR FREDERICK GOWLAND HOPKINS, in his presidential address to the British Association, dealt with a feature of present conditions to which reference has frequently been made in these columns, namely, the effect of scientific discovery on the future of the human race. Scientific research is proceeding faster now than ever before. "I gave some time to a survey," says Sir Gowland, "and came to the conclusion that from eight to ten individuals in the world are now engaged upon scientific investigations for every one so engaged twenty years ago. . . . Japan, China and even India have entered the field and are making contributions to science of real importance." The increase of scientific knowledge is therefore now undergoing a positive acceleration, and this at a time when the world is breathless from the pace of scientific discovery during the past hundred years.

A real planning for the future is needed, but few seem able to credit the necessity for foresight. "I think that few men of affairs," says the president, "seriously believe what is yet probable that the replacement (of man by machine) will impose a new structure upon society." Nevertheless Sir Gowland is not among the pessimists. He believes that the human race has for the most part shown itself to be educable; and that being so, when there is more leisure we shall educate ourselves to use that leisure wisely. He pertinently remarks that there is a great difference between leisure of long permanent duration and the leisure which consists of a few short hours snatched between two periods of toil. He foresees the disappearance of the herd instinct, and with it most of the dangers that now threaten civilised society; he remains unfortunately mute as to the more immediate dangers and difficulties confronting us during the change-over from the old order of society to the new.

Premium Pupils

THE Institute of Chemistry has already called attention to the problem of the premium pupil. In any profession there is a definite " under-world " earning its living by means which may or may not be legal, but which are certainly not moral. Amongst these, the premium pupil is a fruitful source of illicit revenue. Perhaps that condition of affairs is more prevalent in the chemical profession than in many others. Whether that is so or not the opportunities for the potentially dishonest are perhaps greater. The "possessor" of a bogus degree is generally the principal exploiter of the premium pupil ramp. It is unfortunate, though perhaps inevitable, that the general public does not know more about the conditions under which the chemist works. Such knowledge would provide the greatest safeguard against fraudulent acceptors of premium fees. The apparent difficulty lies in the fact that it is not necessarily waste of money to pay a premium for tuition. A very real difficulty among even those whose *bona fides* are above question is the interpretation that the instructor places upon his duties. We have heard a premium described as waste of money and we have had it described (by one who had paid it) as the best investment ever made. We feel that there would be less disappointment and more satisfaction if it were laid down by the Institute of Chemistry, and by the British Association of Chemists, exactly what should be the scope of a premium pupil. It would be good if every premium transaction could be made legally registrable and if, before it was legally binding, this ruling were explained to both parties.

What does a premium pupil expect to learn? As the Institute of Chemistry very rightly points out a thorough knowledge of chemistry or of science cannot be one of these things, even if the " instructor " were competent to instruct in general science (which is usually doubtful since the instructor is not by profession a teacher) and if the business is one which a pupil can join with advantage to himself, the head must be far too busy to give general scientific instruction. If the pupil wishes to gain specialised knowledge of a branch of chemistry, he may possibly gain his knowledge by apprenticing himself as a pupil, but generally he can gain it much better by paying a private tuition fee to a recognised teacher.

A Question of Valuable Knowledge

IN an industrial concern knowledge can be imparted which should be paid for highly. No technical college, unless blessed with a lecturer who happens to have spent many years in that particular branch, can give any adequate instruction into the routine of a given industry. The value of the employees of a firm, no less than value of a firm as an entity, lies not in the correct application of text-book knowledge but in that indefinable art of " knowing how to do things," an art that can only be learnt in the hard school of experience. There is an immense number of things that can be taught by the chief chemist of an industrial concern. In teaching these things he is, in effect, training a man who may one day become a competitor with himself. He has had to pay a heavy price in constant application and worry in amassing that knowledge. It is small wonder that most industrial chemists do not take pains to train their juniors except in the performance of their immediate tasks. For anything more than this, a premium may reasonably be asked. The very best system, in our experience, is for the head of the department concerned to be allowed to engage as assistants a proportion of men willing to pay him for instruction. We have seen some very good results follow provided that the head of the department takes his coaching duties seriously. In too many instances the firm insists on pocketing the premium. That, in our opinion, makes the system almost unworkable unless the managing director becomes personally responsible for the training.

Under these two sets of circumstances the payment of a premium is valuable to the beginner and is justifiable. We can hardy conceive of other circumstances in which any but the smallest fee should be paid. We can never understand the mentality which enables a man to pay a large sum *as a premium* to be trained in science; the Institute justly mentions "analysts . . . . who cannot provide any training which will lead to a . . . recognised qualification."

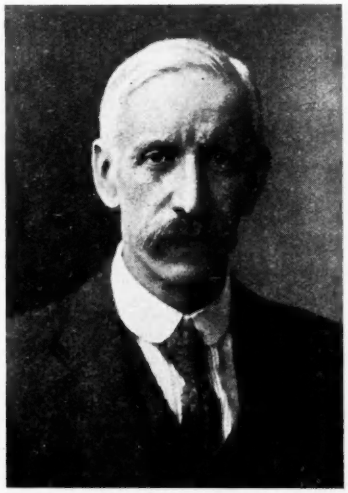
Some Chemical Aspects of Life

Sir Frederick Gowland Hopkins Addresses The British Association

SIR FREDERICK GOWLAND HOPKINS dealt with some universal chemical studies in his presidential address to the British Association at Leicester, on Wednesday, September 6, extracts from which are given below.

THOUGH speculations concerning the origin of life have given intellectual pleasure to many, all that we yet know about it is that we know nothing. We must recognise, however, that life has one attribute that is fundamental. Whenever and wherever it appears the steady increase of entropy displayed by all the rest of the Universe is then and there arrested.

From far back the wonderfully efficient functioning of structures containing chlorophyll has, as everyone knows, provided the trap which arrests and transforms radiant energy—fated otherwise to degrade—and to provide power for nearly the whole living world. It is impossible to believe, however, that such a complex mechanism was associated with life's earliest stages. Existing organisms illustrate what was perhaps an earlier method. The so-called autotrophic bacteria obtain energy for growth by the catalysed oxidation of materials belonging wholly to the inorganic world, such as sulphur, iron or ammonia, and even free hydrogen. These organisms dispense with solar energy, but they have lost in the evolutionary race because their method lacks economy. Other existing organisms, certain purple bacteria, seem to have taken a step towards greater economy, without reaching that of the green cell. They dispense with free oxygen and yet obtain energy from the inorganic world. They control a process in which carbon dioxide is reduced and hydrogen sulphide simultaneously oxidised. The molecules of the former are activated by solar energy which their pigmentary equipment enables these organisms to arrest.



Sir F. GOWLAND HOPKINS,
President of the British Association, 1933.

Are we to believe that life still exists in association with systems that are much more simply organised than any bacterial cell? The very minute filter-passing viruses which, owing to their casual relations with disease, are now the subject of intense study, awaken deep curiosity with respect to this question. We cannot yet claim to know whether or not they are living organisms. In some sense they grow and multiply, but so far as we yet know with certainty, only when inhabitants of living cells. If they are nevertheless living, this would suggest that they have no independent power of obtaining energy and so cannot represent for us the earliest forms in which life appeared.

When the British Association began its history in 1831 the first artificial synthesis of a biological product was but three years old. Primitive faith in a boundary between the organic and the inorganic which could never be crossed, was only just then realising that its foundations were gone. Since then, during the century of its existence, the Association has seen the pendulum swing back and forth between frank physico-chemical conceptions of life and various modifications of vitalism.

Up to the end of the last century and even later the term "protoplasm" suggested an entity to many minds. In his brilliant presidential address at the Association's meeting at Dundee twenty-two years ago, Sir Edward Sharpey-Schafer, after remarking that the elements composing living substances are few in number, went on to say: "The combination of these elements into a colloid compound represents the physical basis of life, and when the chemist succeeds in building up his compound it will, without doubt, be found to exhibit the phenomena which we are in the habit of associating with the term 'life'." Such a compound would seem to correspond with the "protoplasm" of many biologists, though treated perhaps with too little respect.

So long as the term "protoplasm" retains a morphological significance as in classical cytology, it may be even now convenient enough, though always denoting an abstraction. In so far, however, as the progress of metabolism with all the vital activities which it supports was ascribed in concrete thought to hypothetical qualities emergent from a protoplasmic complex in its integrity or when substances were held to suffer change only because in each living cell they are first built up, with loss of their own molecular structure and identity, into this complex, which is itself the inscrutable seat of cyclic change, then serious obscurantism was involved. Had such assumptions been justified the old taunt that when the chemist touches living matter it immediately becomes dead matter would also have been justified.

In 1895 Michael Foster, a physioliogist of deep vision, dealing with the respiration of tissues, and in particular with the degree to which the activity of muscle depends on its contemporary oxygen supply, expounded the current view which may be thus briefly summarised. The oxygen which enters the muscle from the blood is not involved in immediate oxidations, but is built up into the substance of the muscle. It disappears into some protoplasmic complex on which its presence confers instability. This complex, which is like all living substance, is to be regarded as incessantly undergoing changes of a double kind, those of building up and those of breaking down. With activity the latter predominates, and in the case of muscle the complex in question explodes, as it were, to yield the energy for contraction. "We cannot yet trace," Foster comments, "the steps taken by the oxygen from the moment it slips from the blood into the muscle substance to the moment when it issues united with carbon as carbonic acid. The whole mystery of life lies hidden in that process, and for the present we must be content with simply knowing the beginning and the end."

When the development of colloid chemistry first brought its indispensable aid towards an understanding of the biochemical field, there was a tendency to discuss its bearing in terms of the less specific properties of colloid systems, phase-surfaces, membranes, and the like, without sufficient reference to the specificity which the influence of molecular structure, wherever displayed, impresses on chemical relations and events. If the colloid structures did not display highly specialised molecular structure at their surface, no reactions would occur; for here catalysts occurs. Were it not equipped with catalysts every living unit would be a static system.

The phenomena of catalysis, though first recognised early in the last century, entered but little into chemical thought or enterprise, till only a few years ago they were shown to have great importance for industry. Yet catalysis is one of the most significant devices of nature, since it has endowed living systems with their fundamental character as transformers of energy, and all evidence suggests that it must have played an indispensable part in the living universe from the earliest stages of evolution. The catalysts of a living cell are the enzymic structures which display their influences at the surface of colloidal particles or at other surfaces within the cell. Current research continues to add to the great number of these enzymes which can be separated from, or recognised in, living cells and tissues, and to increase our knowledge of their individual functions.

A living cell is the seat of a multitude of reactions, and in order that it should retain in a given environment its individual identity as an organism, these reactions must be highly organised. They must be of determined nature and proceed mutually adjusted with respect to velocity, sequence, and in all other relations. They must be in dynamic equilibrium as a whole and must return to it after disturbance.

If a molecule gains entry into the cell and meets no cata-

lytic influence capable of activating it, nothing further happens save for certain ionic and osmotic adjustments. Any molecule which does not meet an adjusted enzyme cannot fail to suffer change and become directed into some one of the paths of metabolism. It must here be remembered, moreover, that enzymes as specific catalysts not only promote reactions, but determine their direction. The glucose molecule, for example, though its inherent chemical potentialities are, of course, always the same, is converted into lactic acid by an enzyme system in muscle but into alcohol and carbon dioxide by another in the yeast cell. It is important to realise that diverse enzymes may act in succession and that specific catalysis has directive as well as selective powers.

A Knowledge of Hormones

From substances produced temporarily and locally and by virtue of their chemical properties translating for the tissues the messages of nerves, we may pass logically to consideration of those active substances which carry chemical messages from organ to organ. Such in the animal body are produced continuously in specialised organs, and each has its special seat or seats of action where it finds chemical structures adjusted in some sense or other to its own. That such agencies exist and bear the name of hormones, is common knowledge.

Hormones are produced in the body itself, while vitamins must be supplied in the diet. Such a distinction is, in general, justified. We meet occasionally, however, an animal species able to dispense with an external supply of this or that vitamin. Evidence shows, however, that individuals of that species, unlike most animals, can in the course of their metabolism synthesise for themselves the vitamin in question. The vitamin then becomes a hormone. In practice the distinction may be of great importance, but for an understanding of metabolism the functions of these substances are of more significance than their origin.

The present activity of research in the field of vitamins is prodigious. The output of published papers dealing with original investigations in the field has reached nearly a thousand in a single year. Each of the vitamins at present known is receiving the attention of numerous observers in respect both of its chemical and biological properties. The familiar circumstance that attention was drawn to the existence of one vitamin (B_1 so called) because populations in the East took to eating milled rice instead of the whole grain; the gradual growth of evidence which links the physiological activties of another vitamin (D) with the influence of solar radiation on the body, and has shown that they are thus related, because rays of definite wave-length convert an inactive precurser into the active vitamin, alike when acting on foodstuffs or on the surface of the living body; the fact again that the recent isolation of vitamin C, and the accumulation of evidence for its nature started from the observation that the cortex of the adrenal gland displayed strongly reducing properties; or yet again the proof that a yellow pigment widely distributed among plants, while not the vitamin itself, can be converted within the body into vitamin A; these and other aspects of vitamin studies will stand out as interesting stories in the chapters of scientific investigation.

What of the Future?

It is of particular importance to my present theme and a source of much satisfaction to know that our knowledge of the actual molecular structure of hormones and vitamins is growing fast. We have already exact knowledge of the kind in respect to not a few. We are indeed justified in believing that within a few years such knowledge will be extensive enough to allow a wide view of the correlation between molecular structure and physiological activity. Such correlation has long been sought in the case of drugs, and some generalisations have been demonstrated. It should be remembered, however, that until quite lately only the structure of the drug could be considered. With increasing knowledge of the tissue structures pharmacological actions will become much clearer.

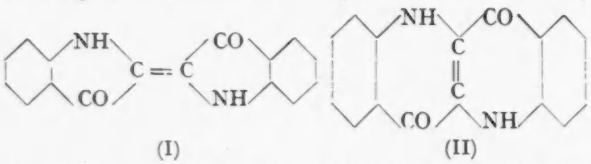
Natural Colouring Matters and their Analogues

Professor R. Robinson's Sectional Address

PROFESSOR ROBERT ROBINSON, F.R.S., presided over the Chemical Section. In his sectional presidential address he said that the chemist has been attracted to the investigation of natural and artificial colouring matters for a variety of reasons, including not only colour-pleasure, the incentive of the knowledge that chlorophyll and hæmoglobin perform some of the most important functions in vital processes, and the industrial importance of dyestuffs and pigments, but also on account of the fact that visible colour more than any other property facilitates the experimental study of organic substances whether by analysis or synthesis. It furnishes a standard of homogeneity or a measure of concentration, it is an invaluable guide in the search for methods of separation and purification, and it at once indicates, by its appearance or disappearance, the occurrence of chemical reaction.

Like a list of best books, a catalogue of outstanding achievements invites destructive criticism. There is, however, no fear in recalling the researches of Laurent, Kekulé, Baeyer and Heumann on indigo; of Sir William Perkin, Hofmann, Otto and Emil Fischer, Meldola and many others on the basic dyes; of Griess and his host of followers on the azo-compounds; of Arthur Pekin and of Kostanecki on the flavones and flavonols; of Willstätter on the respiratory pigments and the anthocyanins; and, not least, of Hans Fischer on the synthesis of the prosthetic group of the blood pigment.

Before dealing with the special group of the anthocyanins, some aspects of which have recently been studied at Oxford,

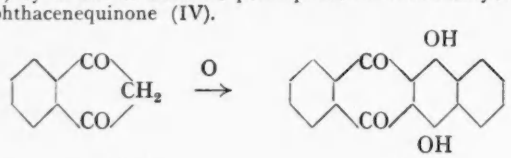


(I) (II)

attention may be directed to the analogies in constitution existing between natural colouring matters and artificial dyestuffs.

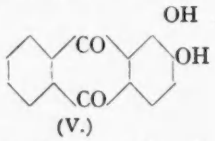
As the result of the researches of Baeyer, indigotin is generally regarded as having the formula I, but a technical digression may be made to the effect that the formula II has not yet been completely disproved.

The oxidation of indoxyl to indigotin appears to favour I, but Gabriel has shown that the oxidation of diketohydrindene (III) by means of alkaline persulphate furnishes dihydroxy-naphthacenequinone (IV).



(III) (IV)

All the indigotin syntheses can give II just as well as I, and II can yield isatin on oxidation. The recent researches of E. Hope prove that some of the products of the action of benzoyl chloride on indigotin possess the skeleton of II., but of course this may arise from an intramolecular rearrangement. The chief argument against II is derived from a consideration of the numerous classes of indigoid dyestuffs which are easily formulated on the model of I.



(V.)

Graebe and Liebermann's recognition of the constitution of alizarin (madder) (V) led, as in the case of indigo, to the industrial synthesis of the colouring matter itself and of numerous derivatives and analogues. At the present time we recognise in retrospect that the most important outcome of the work on madder was the attention focussed on the study

of anthraquinone and its derivatives. It may seem a far cry from the adjective natural dyestuff to the modern vat dyestuff Caledone Jade Green, but the descent is in the direct line—alizarin, Alizarin Blue, benzanthrone, dibenzanthrone, Jade Green. Technical analogues of the anthocyanidins are to be found in the phthaleins, pyronines and rhodamines, and some more or less close dyestuff analogy can be found to correspond with most of the series of natural colouring matters.

The Chemistry of the Anthocyanins

The brilliant and pioneering researches of Richard Willstätter and his co-workers established the main features of the chemistry of the anthocyanins which were recognised as saccharides, occasionally acylated, of the anthocyanidins. They exhibit amphoteric character, forming salts with both acids and bases. Thus the violet pigment *cyanin,* which can be isolated from blue cornflowers, red roses, dark red dahlias and other flowers, forms a blue sodium salt and a red hydro chloride. The hydrolysis of the latter by means of hot aqueous hydrochloric acid into cyanidin chloride and bluclose is represented by the equation:—

$$C_{27}H_{31}O_{16}Cl + 2H_2O = C_{15}H_{11}O_6Cl + 2C_6H_{12}O_6$$

Cyanin chloride Cyanidin chloride Glucose

The alleged crystalline anthocyans prepared by the reduction of natural flavones or plant extracts containing them are nothing but the said flavones with a small proportion of adsorbed colouring matter of anthocyanidin type. It seems much more probable that the flavones and anthocyanins are independently synthesised, although perhaps from a common starting point. The existence of genetic factors which control the occurrence of anthoxanthins independent of that of anthocyanins is strong evidence of this view.

The greater number of the anthocyanins fall into a comparatively restricted number of categories, including (*a*) the 3-monoglucosides and 3-monogalactosides, (*b*) the 3-rhamnoglucosides and other 3-pentoseglycosides, (*c*) the 3-biosides, (*d*) the 3:5-diglucosides, and (*e*) the acylated anthocyanins. It is unnecessary to recount the steps taken in reaching these conclusions, but they have been finally justified by synthesis in many instances.

Colour Variations with pH Value

The amphoteric character of the anthocyanins accounts for the exhibition of a wide variety of colours in a range of solutions of graded *p*H, and this method (demonstration), using buffered solutions, can be employed for the characterisation of anthocyanidins and anthocyanins. Under the specified conditions the results are fully reproducible and the *p*H values have been controlled by electrical methods as well as by the use of indicators. Thus, if the *p*H of an acid cyanin solution is increased until the violet tone matches that an alkaline cyanin solution, the *p*H of which is decreased in order to reach the same condition, then the *p*H of the violet solution will be found to be 7.0—9.0, depending on the shade of violet produced. Cyanin is red in solutions of *p*H 3.0 or less, violet at *p*H 8.5 and blue at *p*H 11.0.

Cyanin was isolated by Willstätter and his colleagues from the blue cornflower and from the red rose; it therefore seemed quite a simple step to assume that the cell-sap in the cornflower was alkaline and that in the rose acid, particularly in view of the fact that the absorption spectra of the coloured aqueous extracts corresond with these conditions. It has indeed been generally assumed that the indicator colour of the anthocyanin will give a measure of the *p*H of the cell-sap, but unfortunately this method cannot be relied upon for several reasons. In the first place there is a glaring anomaly in the fact that direct measurement by electrical methods shows that the cell-saps are all well on the acid side of the neutral point. Thus the conventional view for red flowers may well be correct, but some special circumstances must be invoked in the case of blue flowers.

Cornflower Blue

Turning to the blue cornflower (the cultivated annual kind), a *blue* filtered extract made with distilled water was found to be sufficiently acid to turn blue litmus red. Using 3 g. of petals in 14 c.c. of distilled water (*p*H 6.3 owing to dissolved CO_2), the *p*H was 4.9. Addition of a buffered solution of *p*H 4.4 did not affect the colour, but the colour changed to violet when the B.D.H. universal buffer, *p*H 9.0, was added. It was at once apparent that the only simple explanation is that the cyanin anion is present in a complex form, giving a stable aggregate with a negative charge; in some way the strength of cyanin colour-base as an acid must be vastly increased.

The next step was to attempt the production of blue cyanin sols stable in neutral or weakly acid solution, and some measure of success was achieved, although the solutions are by no means so stable as those from the blue cornflower. If a little crystalline cyanin chloride is added to boiling tap-water (*p*H 8.0) then the usual violet solution results, the colour being what we consider "normal." If, however, the cyanin is triturated in the cold for a minute with the water and gradually heated to boiling with shaking, then a beautiful *blue* solution results. The fact that the same materials can be used to produce two entirely different results shows that it can only be the state of aggregation of the cyanin which can have stabilised the anionic charge and hence produced a blue colour under the conditions that normally produce a violet solution. If very small quantities of cyanin chloride are employed, this phenomenon can be reproduced using distilled water. Willstätter and Everest found that their cornflower extracts contained xylan and other polysaccharides, and we have attempted to produce blue acid cyanin solutions in the presence of various polysaccharides.

Colloidal Solutions of Blue Pigments

Probably these colloid associations are much more readily formed at values of *p*H between 5.5 and 6.5, and on the whole the blue flowers have less acid cell-saps than the red flowers. The petals of the rose in contrast with the cornflower constitute an exception (*p*H 5.6). The pigment of the orange-red polyantha rose "Gloria Mundi" is found to be pelargonin and the *p*H was 5.5. The red-flowered hydrangea had petal *p*H 3.75, whilst the blue flowers gave *p*H 4.9; similarly the red-flowered linum (anthocyanin based on delphinidin) gave petal *p*H 4.6, and the blue variety *p*H 5.9.

Blue anchusa was 6.2; sweet peas, all about 5.3; delphiniums, 5.6 (most violet shade), 5.8 (most blue shade); clematis (blue), 5.4; viola, 6.2 (blue violet), 6.0 (reddish violet); lobelia (blue), 5.7. It must be emphasised that these variations of *p*H are quite insufficient in themselves to account for the colour changes and it is evident that the most important single factor for flower colour, given the nature of the anthocyanin, is the question of the condition of the pigment in solution, and it would appear that *all blue flowers are coloured by colloidal solutions of their respective pigments.*

Summarising this works, the main factors affecting flowers are (1) the nature and concentration of the anthocyanins and other coloured substances present; (2) the state of aggregation of the anthocyanin in solution—the *p*H of the cell-sap is one of the subsidiary factors affecting this, and naturally the presence or absence of protective colloids is another; and (3) the presence or absence of co-ipgments and, problematically, the effect of traces of iron and other complex forming metals.

Carotenoids and Flavines

During the discussion which followed the presidential address by Professor R. Robinson, F.R.S., on "Natural Colouring Matters and Their Analogues," Dr. R. Kuhn dealt with carotenoids and flavines. In recent years many new natural colouring matters of the carotene group have been discovered. The first products of synthesis in plants are the dyestuffs with 40 carbon atoms, from which carotenoids, containing fewer carbon atoms, are produced by oxidative disintegration. This splitting of the carbon-chains may occur in different ways:—

$C_{40} \longrightarrow C_{20} + C_{20}$, β-carotene $\longrightarrow$ 2 vitamin A.

$C_{40} \longrightarrow C_8 + C_{24} + C_8$, lycopene $\longrightarrow$ bixin + 2 methylheptenone.

$C_{40} \longrightarrow C_{10} + C_{20} + C_{10}$, proto-crocin $\longrightarrow$ crocin + 2 picrocrocin.

$C_{40} \longrightarrow C_{13} + C_{27}$, proto-azafrin $\longrightarrow$ (ionone) + azafrin.

Widely distributed in nature are certain water-soluble dyestuffs, coloured yellow and fluorescing intense green. They have been called flavines. Ovoflavin from egg-albumin and lactoflavin from milk have been prepared by Th. Wagner-Jauregg in crystalline condition. The elementary analysis suggests the formula $C_{17}H_{20}N_4O_6$. According to the experiments of P. György, lactoflavin, three times recrystallised (m.p. 267°), promotes normal growth, when administered in

doses of 5 γ per day to rats deprived of vitamin B_2. The properties of flavines (lyochromes) and of carotenes (lipochromes) are in many respects complimentary.

	Lyochromes.	Lipochromes.
Solubility	Soluble in water	Insoluble in water
Colour	Yellow, orange	Yellow, orange, red
Fluorescence	Green (very strong)	Yellow-green (weak)
Combined with	Proteins, polysaccharides	—
Composition	Containing nitrogen	Nitrogen-free
Acids	Resistant	Labile
Alkalies	Labile	Resistant
Oxidation	Resistant	Labile

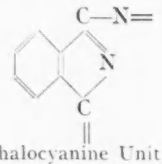
The flavines can be reversibly reduced (flavine $+2H=$ leuco-flavine), and therefore they act in the cell as transporters of oxygen. When combined with carriers of high molecular weight, they appear to act more strongly as enzymes (O. Warburg). Apparently the flavines are exogenous precursors of such oxidation-enzymes (pro-enzymes). The undialysable enzyme preparations act also as vitamin B_2; the dialysable flavines have no more enzymatic activity; the irradiated flavines, soluble in chloroform, have neither the properties of enzymes nor those of vitamin.

A New Class of Synthetic Colours

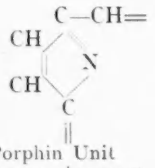
Dealing with the phthalocyanines, a new class of synthetic colours, Dr. R. P. Linstead pointed out that when phthalimide is heated with certain metals, notably iron and magnesium in a current of ammonia, a complex reaction occurs with the formation of highly coloured substances of a novel type. These have been named *phthalocyanines* from their origin and deep-blue colour. Identical compounds may be made from *o-cyanobenzamide* $C_6H_4(CN)CONH_2$ by the action of metals and metallic derivatives, such as oxides, at temperatures of about 250° C. The metal may be eliminated from the magnesium compound by the action of concentrated sulphuric acid to yield phthalocyanine, the parent substance of the group.

Like indigo and idanthrone, these substances may be purified by crystallisation from boiling quinoline and by sublimation in a vacuum, and may be obtained as homogeneous macrocrystalline blue solids with a fine purple reflex. Analysis shows them to contain the unit $(C_8H_4N_2)$ combined in their simplest form with a divalent metal or with hydrogen in the manner: $(C_8H_4N_2)_4H_2$ or $(C_8H_4N_2)_4$. metal. The mode of synthesis and the reactions of these compounds indicate that they contain a system of *iso*-indole rings linked by nitrogen atoms and forming a large ring with the metal held in the centre by primary and secondary valencies.

The phthalocyanines exhibit two features of special interest. First, their fundamental unit resembles that of porphin, which is the basis of the naturally occurring pigments of the chlorophyll and hæmin group. The structural unit of the natural pigments differs in containing no benzene ring and in having methine (—CH=) links in place of nitrogen:—



Phthalocyanine Unit



Porphin Unit

Secondly, the phthalocyanines are among the most stable of complex organic compounds. For example, the copper compound sublimes unchanged at 600 deg.; dissolves in strong sulphuric acid without decomposition or loss of metal; and resists the action of molten caustic potash. Other compounds of the group show a similar stability.

Food and Drug Analysis at Birmingham

City Analyst's Plea for New Legislation

In his annual report for 1932, Mr. H. H. Bagnall, the Birmingham City Analyst, lays stress on the urgent necessity for a new Act which will take into account the very different conditions prevailing at the present day as compared with those of 1875, when the present food and drugs legislation was originally passed. Descriptions of and standards for a large variety of foods and compounded articles are necessary, particularly for the latter, of which very few examples existed in 1875 and which, therefore, were not adequately provided for in the Act.

Of the great variety of articles which may be examined by a public analyst, in only a few cases has an attempt been made to fix any sort of standard of composition, so that the ordinary purchaser is often in doubt as to what he ought to get when demanding a particular article. The only food stuffs for which there is a standard laid down are condensed milk and dried milk (composition and label), spirits (percentage of proof spirit), butter and margarine (amount of water), and the amounts of certain specified preservatives in a number of food stuffs. There is also a so-called presumptive limit laid down for milk, a sample being presumed, unless the contrary is proved, to be adulterated if the percentage of fat or solids-not-fat fall below a definite figure. In all other cases a standard of compopsition has to be fixed by the analyst himself and stated on his certificate. This may be challenged by the defence and the decision as to whether the standard so set up is a reasonable one is left to the magistrate, a state of things which is unfair to the magistrate, to the purchaser, and to the analyst.

The analysis of milk, or rather the interpretation of the results of analysis, is a question which, perhaps, has aroused more controversy than any other coming within the purview of a public analyst. Milk, being a natural and not a manufactured article, is liable to variations in composition. On an average the constituents present are fat 3.75 per cent., protein 3.4 per cent., lactose 4.7 per cent., ash 0.75 per cent., other solid ingredients 0.05 per cent., and water 87.35 per cent. For the purpose of analysis the protein, lactose and ash are usually added together and are technically described as solids-not-fat, the average percentage being about 8.9 per cent. The sum of the fat and solids-not-fat is described as the total solids and amounts on an average to 12.65 per cent. The natural variations of the solids-not-fat usually extend over the limits 8.5 to 9.2 and of the total solids 11.5 to 13.0.

Before 1901 a public analyst had no definite official guide as to the percentage of solids-not-fat which should be taken as the lower limit for genuine milk, although 8.5 per cent. had been tentatively adopted by the Society of Public Analysts. In that year, however, a Departmental Committee was appointed by the Board of Agriculture to enquire and report as to what regulations might with advantage be made for determining what deficiency in any of the normal constituents of genuine milk or what addition of extraneous matter or proportion of water in a sample of milk should raise the presumption that the milk was not genuine. As a result of the deliberations of this Committee, regulations were made by the Board of Agriculture to the effect that when a sample of milk contained less than 3.0 per cent. of fat it should be presumed for the purposes of the Food and Drugs Act, until the contrary was proved, that the milk was not genuine by reason of the abstraction of fat or the addition of water, and secondly that when a sample contained less than 8.5 per cent. of solids-not-fat it should similarly be presumed until the contrary were proved, that the milk was not genuine by reason of the abstraction of non-fatty solids or the addition of water.

In practice non-fatty solids cannot be abstracted from milk without destroying the milk as such, so that the presumption in the case of a deficiency of solids-not-fat is that water has been added. This figure of 8.5 per cent. is not a definite standard and does not preclude the popssibility that a milk containg less than 8.5 per cent. may be genuine, but in this case the vendor has the responsibility of proving that the sample of milk is genuine. On the other hand, a sample containing over 8.5 per cent. may be watered. In this case the prosecution has to prove that the sample is adulterated.

A New Inorganic Heat Carrier

By THEODOR KAYSER

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This article originally appeared under the title of "Wärmeträger in der Wärmewirtschaft" in "Brennstoff und Wärmewirtschaft," Vol. 2, 1933. It was translated by permission and brought to the notice of our American contemporary "Chemical and Metallurgical Engineering," from the July issue of which it is now reprinted. For greater ease of reference, all temperatures and other units have been converted to the English system from the C.G.S., which accounts for some of the apparently peculiar temperature intervals chosen.

NEED for suitable methods of accumulating heat, as well as the requirement for means to solve numerous difficult thermal processes has, in the past, given rise to the study of many substances in the hope that materials would be found to fulfil the requirements in a satisfactory manner. The use of water for heat storage, to equalise fluctuations between the heat supply and energy delivery and for the improvement of thermal efficiency, is well known. Because of its high specific heat, water would seem to be quite suitable for the purpose, but it is only satisfactory when applied to processes carried on at the lower temperatures. Furthermore, as a heat carrier, it is restricted to the lower temperature ranges. At a temperature of 706.1°F., it reaches its critical point, resulting in a pressure of 3,226 lb. per sq. in. Even at temperatures much lower than this, undesirably high pressures occur. Glycerine is also unsatisfactory since it, like most organic materials, is more or less easily decomposed and is useful only within low temperature limits.

Limiting Features of Other Carriers

In recent years many other organic products, such as diphenyl, diphenyloxide and others, have been used increasingly. Other heat storage materials, including resins, metals, and salts, have only been partially successful because, in making possible high temperatures their use results in undesirable expansions, pressures and gases, which lower their capacity for heat accumulation.

Diphenyl, diphenyloxide and their mixtures have been studied extensively and found satisfactory within limits. Diphenyl, for example, boils at 4491.5°F. at atmospheric pressure but, of course, develops comparatively high pressures at higher temperatures. It decomposes at 980°F. and is not considered useful above about 900°.

Let us consider the requirements of an ideal heat carrier. Such a substance should be manufactured at reasonable cost and present the highest possible heat capacity. Working temperatures up to possibly 1,650 to 1,830°F. should be possible without decomposition. The substance should not corrode the ordinary metals and should be as fluid as water within the widest possible range of temperature so that excessive pressures would not be developed. By this means dangerous stresses in the heating apparatus would be avoided.

Development of "NS" Fluid

Many failures in the search for such material have shown that there is a very limited selection of substances capable of satisfying such diverse requirements. Recently a fluid was compounded by Ernst Sander, an engineer of Berlin, Germany, and this has been named "NS" fluid (Ger. Pat. 519,062 and other foreign patents). According to tests made thus far, the material embodies quite closely the ideal set up in the preceding paragraph. The fluid consists of a combination of different inorganic salts. A suitable mixture consists of one mol of NaCl combined with one mol of $AlCl_3$. The mixture solidifies to a homogeneous mass and at 302°F. liquefies into a well-defined solution which regulates its molecular ratio by expelling any excess of $AlCl_3$ which may be present. As a variant of this formula it is possible to replace the Na or Al by an optional univalent or trivalent metal, with the result that the physical properties of the fluid are altered. The general formula, therefore becomes $R'Cl + R'''Cl_3$.

Sander's fluid is composed of the three components NaCl, $AlCl_3$, and $FeCl_3$. His work was first examined by Dr. von Deines of the Institute of Physics and Chemistry at Berlin University. A determination of physical data with the Bunsen ice calorimeter established the fact that the specific heat is 0.7 and the specific weight from 1.96 to 200. The heat-conducting capacity of the solution is so favourable that, for example, in passing water through a heater in which the temperature of the water varied from 64 to 79°F., no insulating scale of crystals developed which might have hindered the satisfactory transfer of heat.

The heating-cooling curve of the fluid shows that it has a softening range that can be regulated as desired below the determined melting point of 302°F. This is an important advantage in practical use because of the equalisation of pressures within the apparatus. Once liquefied the solution remains in a surprisingly fluid condition, a very favourable situation. Its expansion at medium temperatures is about 10 per cent. It can easily be melted in glass tubes without breaking the latter when the solution solidifies, as would be the case with a metal. This is an important factor in heating apparatus.

When used in a closed system, the solution does not decompose. If it is heated in the open, the $AlCl_3$ sublimes at higher temperatures in small quantities, while corresponding quantities of NaCl are expelled. In inclosed systems this is entirely eliminated. Water acts upon the solution by decomposing it. Exposure to the air is not advisable, therefore, since the liquid absorbs moisture and changes its characteristics. No corrosive action on iron was found to exist, which is to be expected from the composition of the fluid.

Calorific Effects

The calorific effect was measured in a large number of tests. At a demonstration by Dr. von Deines, made in the presence of Professor Hoffmann of the Physical-Technical Reichs Institute, and of the author, a water heater served as the test apparatus. This was filled with "NS" fluid and electrically heated. If not an apparatus entirely suited to scientific determination, it was nevertheless satisfactory for a practical demonstration. The results of previous work were confirmed, showing an average specific heat in the range from 570 to 750°F. of 0.7. The calculated overall heat transfer coefficient shown by the test was K = 23.6 B.Th.U./sq. ft./°F./hr. from the solution to water through iron. Within the temperature range from 302 to 1,508°F. the solution remained a thin liquid somewhat like water and did not decompose despite repeated liquefying and reheating.

Of course, these were only laboratory tests, but continued later tests have been made with "NS" fluid as a heat carrier in apparatus especially designed for the purpose by a leading chemical industrial firm. The results so far have been quite satisfactory. No disturbances occurred nor was there any evidence of corrosion on iron and copper.

Fluid Suitable at High Temperature

As a result of continued tests extending over nine months in an oil distillation plant, rules were devised covering the use of "NS" fluid in practice. Owing to the limited durability of the usual construction materials, it was necessary to limit all tests to a maximum temperature not much over 1,500°F. The behaviour of the fluid, however leads one to believe that it can be used successfully at still higher temperatures provided suitable construction materials are available.

Heretofore, in very high temperature operations it has usually been necessary to resort to direct firing, depending either on radiation or on the transfer of heat by means of flue gases, or both. It is obvious that the heat capacity of the latter is far below that of other heat-carrying materials. The accompanying tabulation gives a comparison between combustion gases and "NS" fluid. Necessarily, the available heat content of any given quantity of combustion gases is considerably reduced by the excess air required to effect combustion. In addition, a decided disadvantage to their use lies in the great increase in volume of gases at high temperatures. Furthermore, their useful heat content increases rather slowly with rising temperature as, for example, beween 572 and 1,472°F., where the difference per cubic foot of combustion gases amounts to only 1.15 B.Th.U.

Still another disadvantage arises only within limits, since the utility effect decreases very quickly after passing a certain point. Under some circumstances, over-heating of the heat-transfer surface is a disadvantageous result of the use of combustion gases.

Amount of Heat Transfer Surface

It is also difficult to obtain sufficient heat-transfer surface in the oven in some cases. A typical example is to be found in the process of coking coal at low temperatures. Low-temperature carbonisation has been generally disappointing so far. Difficulties, principally, have not been in incomplete

Comparison of Combustion Gases and " NS " Fluid.

Temp. °F.	Vol. at 760 mm. cu. ft.	Heat Content B.Th.U./cu. ft.	" NS " Fluid** Heat Content B.Th.U./cu. ft.
212	48.3	2.67	—
392	61.2	4.33	31,200
572	74.2	5.47	47,200
752	87.2	6.33	62,800
932	100.0	6.98	78,500
1,112	113.0	7.52	94,300
1,292	126.1	8.13	110,000
1,472	138.8	8.62	125,700
1,652	152.1	9.03	141,300

Combustion Gases.*

* Gases from the combustion of lignite briquets, containing 12 per cent. CO_2, corresponding to 46 per cent. excess air.

** The increase in volume of the " NS " fluid, which at 1,472° F. amounts to about 100 per cent., has not been taken into consideration in these figures.

knowledge of the chemical requirements nor in faulty construction of the equipment, but primarily in the lack of specially suitable heat carriers.

A comparison of the available heat, resulting from a drop in temperature from 1,472° to 572° F., in the case of combustion gases and " NS " fluid, is interesting. For 1 cu. ft. of combustion gases, the available heat is approximately 1.15 B.Th.U., and for 1 cu. ft. of "NS" fluid, about 70,000 B.Th.U. (This takes into consideration the volume increase of the molten salt.) One lb. of water steam condensing at atmospheric pressure makes available 970 B.Th.U. Without any considerable initial velocity, therefore, " NS " fluid makes it possible to transmit many times as much heat as would be transmited by a much larger volume of combustion gases. On this account oven units can be made smaller and the cost of construction thereby reduced.

In distillation and cracking plants, it should be possible through the use of " NS " fluid to work with considerably lower temperatures. On this account, the life of the tubes should be increased and thinner tubes made possible. An important advantage for " NS " fluid in the oil industry is the elimination of the fire hazard in case of a break in the tubes. If this were to occur, the fluid would simply mix with the oil and cause no damage.

Utilisation of Waste Heat

There are many other possible applications for heat carriers possessing such properties as " NS " fluid. Perhaps the most important field will be found in the utilisation of waste heat and excess heat energy. One important application may be the superheating of steam between the high-pressure and low-pressure stages in turbines, because the material is capable of storing any desired degree of superheat and of giving complete uniformity of temperature.

Other applications will be found in melting, roasting and similar processes which are carried on in retorts, pipes, muffles and other equipment in the temperature range from 750° to 1,478° F. In many operations, such as malting, heated air at absolutely uniform temperature is required. Electric heat assures such constant temperature, but is usually rather expensive. " NS " fluid gives the same assurance, since comparatively large quantities of fluid are placed as a buffer between the heat-taking and heat-giving elements. In such cases it is entirely possible to use ordinary fuels for firing or, through the heat storage possibilities of the substance, off-peak electric power.

A very wide field for " NS " fluid is possible in connection with household appliances, such, for example, as hot water heaters, kitchen stoves, room heaters, etc. Interesting opportunities would seem to be open to the builders of heating apparatus.

The Chemical Industry of Argentina

Effect of Import Duties

THE condition of the chemical and allied industries in the Argentine Republic are fully dealt with in the latest publication of the Department of Overseas Trade relating to that country. This report, entitled " Economic Conditions in the Argentine Republic," and obtainable from H.M. Stationery Office (5s.), is dated January 31, 1933, the previous report covering the period to October 31, 1931.

Hitherto the country has been largely dependent on imported heavy chemicals, but the report states that the increased cost of importing heavy chemicals consequent on the higher duties and depreciated exchange has caused local manufacturing processes to be adjusted with the object of eliminating their use wherever possible. At the same time interest has been stimulated in the local manufacture and finishing of products such as silicate of soda and copper sulphate. The import trade has thus been considerably restricted. Of the available business, United Kingdom suppliers have maintained their share, though competition continues to be severe. The tendency of prices has been generally downward.

A Line Worth Investigating

Chemicals for boiler and feed water treatment do not appear to have been studied by British firms, but this line is worth investigating, especially with regard to the railways. It is not a question merely of water softening. At present the business is practically monopolised by United States firms. Any newcomer to the market would have to face an initial outlay to cover the expenses of the indispensable service man to conduct trials, which would not be less than 800 pesos (£160 at par) a month.

The trade in fine chemicals for analytical use is chiefly in the hands of Germany and France. Small orders for British fine chemicals have been placed recently by the University of Buenos Aires.

As regards home produced materials, the chief of which are petroleum, casein and quebracho, low prices are chiefly responsible for such difficulties in marketing the products as occur. After remaining for three years at a steady figure of between 1,400,000 and 1,500,000 cubic metres per annum, in 1931 the production of petroleum in Argentina increased sharply by 30 per cent., placing this country ninth among the oil-producing countries of the world, though still with only 0.9 per cent. of the total.

Production of Casein

The production of casein has been considerably less than last year owing to the low prices. On the other hand exports have been larger. The heavy tariff imposed on imported casein in the United States has seriously restricted what used to be an excellent market for this commodity. Of a total of 17,680 metric tons exported in 1932, 2,095 tons were shipped to the United Kingdom, compared with 1,329 tons during 1931. The stock held in the country cannot be accurately ascertained as much of it is in the hands of small producers, but it is believed to be very low.

Already very depressed a year ago, the condition of the quebracho industry has been made still worse by a further fall in prices. There was nevertheless an increase in exports of solid quebracho extract in the seven months to the end of July, 1932, compared with the corresponding period in the previous year, due to the fact that a number of manufacturers were forced to sell their stocks at a sacrifice in order to meet their obligations. The exportation of logs on the other hand, as a result of the low price of the extract, fell from 58,634 tons to 35,873 tons in the same periods. Any improvement must await a change for the better in the state of the leather industry.

Letters to the Editor

The Editor welcomes expression of opinion and fact from responsible persons for publication in these columns. Signed letters are, of course, preferred, but where a desire for anonymity is indicated this will invariably be respected. From time to time letters containing useful ideas and suggestions have been received, signed with a nom-de-plume and giving no information as to their origin. Correspondence cannot be published in THE CHEMICAL AGE unless its authorship is revealed to the Editor.

Displaced German Scholars

SIR,—When Mussolini came into power, one of his first acts was to throw open Italian Universities to the persecuted students of other lands, to those who were prevented by hatred, jealousy and other base motives from pursuing studies in their own country. So magnificent a gesture is not to be belittled but it must surely have been made with the knowledge that every such student would become a missionary in the cause of Italy. The medical student went forth to recommend Italian remedies and Italian health resorts; the engineer to specify Italian machinery, and so on.

What you and your correspondents fail to realise is that by the appopintment of men of world renown to professorial posts in this country, schools are founded and students who would otherwise have gone elsewhere are attracted to England. Formerly the English chemist was trained in Germany and returned to use German apparatus, German chemicals and German machines; indeed the pre-war state of our dyestuffs industry, and others, may well have been due at least in part to this factor. Henceforward we are to have a long overdue reversal of the order and the students who come to Manchester from abroad—and they certainly *will* come—will return with a knowledge of England, of English institutions and culture and of English products which cannot fail to be of the greatest benefit to this country as a whole. It must remain to their lasting honour and credit that no protest has come from any responsible Englishmen holding academic posts and who might have felt that the plum of which you speak had been taken from them.—Yours faithfully,

HAROLD J. STERN,
Ph.D. B.Sc., (Liv.) B.Sc. (Oxon).

London, E.16.

Sulphur from Gas Purification

SIR,—In the editorial of your issue of August 26 you draw attention to a new purifying process for gas, which you suggest might be the means of increasing the production of sulphur at home. This is at least the construction which might be put on your remarks by the casual reader. As the efficiency of the standard method of gas purification employing iron oxide has a process efficiency of practically 100 per cent., another process supplanting it cannot increase the production of sulphur.

The process referred to in your columns is presumably that of the Gessellschaft fur Kohlentechnik, Dortmund, which has had a certain amount of success, or the Thylox process. Neither these processes nor any other purifying process produces a net revenue and is therefore not likely to be introduced for its own sake. The output of home produced sulphur is therefore not likely to be increased, unless there is an increased demand for purified gas. As far as the gasworks and coke ovens of Great Britain are concerned they carbonise 31 million tons of coal, from which about 120,000 tons of sulphur could be obtained.

As only a certain portion of the gas produced by coke ovens is purified the actual production of sulphur from this source falls short of the above figure, being of the order of 85,000 tons of sulphur per annum. This quantity represents nearly 29 per cent. of the requirements of the sulphuric acid works of this country, which absorb annually in the form of cuprous, and non-cuprous ores, zinc concentrates, sulphur and spent purifying material, about 294,000 tons of sulphur in the production of about 900,000 tons (100 per cent.) of sulphuric acid. Even if all the gas in Great Britain were purified, the demand for sulphur could not be satisfied by the home industry, unless other sources were tapped (such as mineral sulphates). This aspect, however, is besides the point.

As long as sulphurous metallic ores are roasted, which produce over 50 per cent. of the sulphuric acid in this country, there is no inducement or need for the carbonising industry to provide this additional amount of sulphur even if it were able to do so. Unfortunately, most of these ores are imported and will continue to be imported, whatever the position with home produced sulphur may be. As far as the consumption of brimstone sulphur is concerned, an almost equally good quality can be produced from spent oxide. Indeed, this sulphur is equal in every way to that produced direct by any of the existing purifying processes. It seems unlikely that a drastic change in the economic and natural conditions will take place, which are the determining factors in this case, as in others, whatever progress in methods of gas purification might be made.

My observations are offered lest a wrong impression be gained with regard to the possibilities of creating sulphur producing industry at home. It is not lack of goodwill or absence of a progressive spirit in the carbonising industry that prevents it from adjusting itself to the new " national and Empire " outlook.—Yours faithfully,

" PROTEUS."

SIR,—Whilst we must express our appreciation of the attention which you drew to gas purification in your editorial of August 26, we feel that the case which you state with regard to future gas purification in the Ruhr may leave a wrong impression in the minds of your readers. The new process to which you refer is presumably the Thylox process which has been used in America for the purification of gas for some time. This process, like many other recent innovations, has so far failed to replace the established method of extracting hydrogen sulphide from gas with iron oxide. The lack of success has not always been due to technical shortcomings. On the contrary one or two processes are perfectly satisfactory from a technical point of view, but all these processes fail to remove completely hydrogen sulphide from gas. While a process efficiency of 95 to 98 per cent. may be satisfactory in many chemical processes, it is not so in gas purification. It is, therefore, necessary to resort to oxide purifiers in the end in order to remove the last trace of hydrogen sulphide. Every gas engineer knows how difficult it is to operate purifiers under these conditions.

Quite apart from these aspects, no case has yet been known where the replacement of oxide purification by other processes has been a financial proposition. Indeed, all the large purifying installations in the Ruhr are using oxide of iron, and mostly Lux. Large additions have been made fairly recently, so that it is most unlikely that these comparatively new plants—most of them have been erected in the course of the last ten years and less—should be scrapped. The information which we have received on the subject seems to indicate that the one or two installations of the Thylox process in the Ruhr, are more of an experimental nature in order to produce elementary sulphur. This product is comparable in every way with the material produced by the Thylox process and has the advantage of being entirely free from sulphur after its separation from the purifying liquor, which consists of sodium arsenate.

With regard to the comparison of cost, the excellent book by W. Gluud, " By-product Coking Industry," (Ernest Benn, Ltd.) gives the cost of the prpocess on page 576. Under American conditions the total cost of operation is 0.89 cents per thousand cu. ft. of gas, or 0.44d. per thousand cu. ft. This figure does not include capital charges. If, for the purpose of comparison, maintenance charges are also deducted, the total operating cost amounts to 0.79 cents or 0.39d. per thousand cu. ft. at the standard rate of exchange. Against this figure may be cited authentic information published on this subject in the Report of the Departmental Committee on Area Gas Supply, London, 1930 (page 50) where the total net operating costs are given as 0.23d. per thousand cu. ft. for a relatively small plant capable of dealing with 4,000,000 cu. ft. of gas per day. It is generally conceded that larger plants such as you speak of, dealing with 50 million cu. ft.

per day, can be operated at a lower figure than that given in the report.

Although much can be done to improve the efficiency of the oxide purifying process and to reduce its cost, we feel that the carbonising industry has done everything to supply the needs of the country as far as possible. It is obviously limited by the amount of gas required by the public and the sulphur which the gas contains. It is regrettable that the sulphur in the form of spent oxide coming from this source is not priced higher, and we feel that its value could be increased materially if the sulphur were recovered from it as such.—Yours faithfully,

THOMAS DUXBURY AND CO.

Palace Chambers,
Westminster, S.W.1.

Oil from Coal Schemes

SIR,—The leader, "Oil from Coal Schemes," which appeared in your issue of August 26 is a necessary and timely warning. There is no branch of chemical technology that has such an unsavoury history as that of low temperature carbonisation. One has only to recall the activities of a number of companies formed during the last six years, and to compare their performances with their promises, to realise what a ramp the whole business has been. There were indications, however, of a welcome change taking place, and one concern at least has done much to live down the reputation for which the early promoters were responsible. It had a hard fight, but it appears to be making good headway. It is to be hoped that there will be no repetition in other quarters of the mistakes of the past.

The prospect of obtaining oil from coal seems to fascinate the general and the investing public. Every inventor who makes the smallest contribution to the problem immediately conjures up visions of amassing considerable wealth, and every company promoter regards his proposition as a "gold mine." There is no "gold mine" in coal treatment, and we have long waited for the low temperature process that will enable normal dividends to be earned. This is not surprising when we give the matter close study.

In the first place, it must be realised that the very essence of low temperature distillation of coal involves a loss of 10 to 15 per cent. of the raw material, exclusive of process loss. If we take a normal high-volatile coking coal, containing 5 per cent. of hygroscopic moisture, and having regard to the water of constitution, or water of formation, of the coal, there will be produced a total of 10 to 15 per cent. of liquor, depending upon the state of maturity of the original coal. This loss is far too frequently overlooked. Not many weeks have elapsed since we were told that in a low temperature process yielding 70 per cent. of semi-coke there was produced 30 per cent. of other products, but no mention was made of the proportion of liquor included in the latter figure.

A much more serious miscalculation was recently made in connection with a memorandum prepared for the newly-formed South Wales Industrial Development Council, where it was stated that in the carbonisation at low temperatures of 4,500,000 tons of coal, yielding altogether 12.6 per cent. of the by-products tar oils, pitch and disposable gas, there would be "saleable as petrol, oil or gas" not less than 1,260,000 tons. The actual yield of by-products available for sale would really be 567,000 tons, assuming that there would be surplus gas available, which is often very doubtful.

The memorandum in question contained quite a number of other figures which were obviously incorrect, while others were open to criticism. One other example will suffice. It was stated that in treating coal by hydrogenation, the "dead cost figure for the production of *liquid products* from coal is 7d. per gallon, or of the order of £8 10s. per ton." This figure was then taken as the cost of production of *fuel oil*, and an attempt was made to show that fuel oil could be made at much lower cost by low temperature carbonisation. It is necessary to point out that there is no authority whatever for stating that *liquid products* or that *fuel oil* costs 7d. per gallon to produce by hydrogenation. The use of the general term "liquid products" instead of "petrol" is inexcusable, in view of the deductions drawn from the introduction of the broader term. Further, one is not justified in claiming that while low temperature oil is produced to-day at an uneconomic price, that price must be the basis for the "cost of production," as was done in the case in question.

It is essential to emphasise these points because a grandiose scheme is being visualised in South Wales, involving a capital of £8,000,000, and embracing the installation of a hydrogenation plant and ten low temperature plants. Such a scheme can only be characterised as extremely rash and speculative. In the first place, as the hydrogenation process has yet to be proved on a commercial scale, and as the installation of one plant is about to be commenced by Imperial Chemical Industries, Ltd., it would be inadvisable to embark upon two large-scale experiments at the same time, with plants involving the expenditure of millions of capital. Secondly, the coals of South Wales are not so suitable as English coals for treatment by hydrogenation. Thirdly, only about 30 per cent. of Welsh coal is suitable for the production of payable quantities of low temperature oils.

Further, as in other coalfields, South Wales produces a good deal of duff for which there is only a limited market. This duff, or slack, is of low volatile content, being mostly semi-anthracitic and anthracitic, and the most urgent problem besetting Welsh coalowners is the up-grading or re-conditioning of this slack. This can be done by carbonising blends of choking coal and the non-coking fines at low temperatures, in suitable narrow coke ovens, or other proved types of retorts. The yield of oil per ton of blend may not exceed 10 or 12 gallons, but the enhanced value of the solid fuel will justify such treatment; with low-volatile coals, a minimum of liquor is produced. Lastly, in some parts of the coalfield the coking coals may be treated direct, but in view of the comparatively limited quantities of such coal available, the better policy would be the carbonisation of blends, concentrating more on the solid fuel than on liquid fuel.

There is good scope for low temperature carbonisation in South Wales, provided the problem is approached in the right direction, and that, as pointed out in the leader referred to, the schemes are scrutinised by independent experts who are not professionally or financially interested in low-temperature processes.—Yours faithfully,

JOHN ROBERTS, D.I.C., M.I.Min.E.

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Metals from Secondary Sources

Recovery Statistics for the United States

ACCORDING to statistics published by the United States Bureau of Mines, the total value of non-ferrous metals recovered from secondary sources in 1932 was $65,022,800 this being $45,651,800 less than in 1931. The drop in total value was due partly to lower average prices for the metals other than nickel and aluminium, but the output of each secondary metal declined. Secondary copper recovered and brass remelted decreased nearly 110,000 tons, and the calculated value was less than half that in 1931. The quantity of zinc used for galvanizing declined greatly so that zinc drosses were scarce, redistilled zinc produced decreased about 6,900 tons, and smaller quantities of skimmings were available for zinc chloride, lithopone, etc. Detinning plants treated about 47,800 long tons less clean tin-plate clippings in 1932 than in 1931. As the trend of prices of primary metals was steadily downward, scrap metals, alloys, drosses, and residues bought by dealers could not be sold at a profit. Foundry purchases of scrap metals and composition ingot were at a minimum, for many such establishments were idle and others only purchased material to fill spasmodic orders.

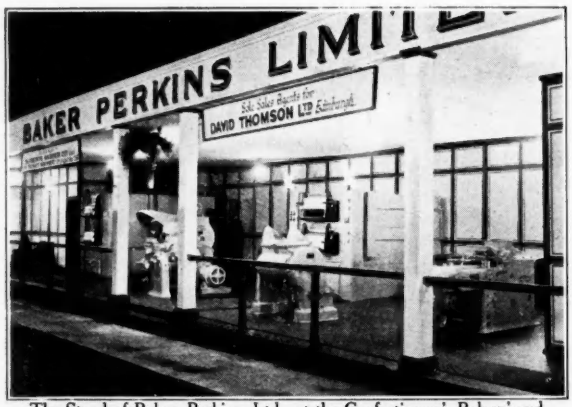
"Secondary metals" are those recovered from scrap metal, sweepings, skimmings, and drosses and are so called to distinguish them from metals derived directly from ores, which are termed "primary metals." The distinction does not imply that secondary metals are of inferior quality, for metals derived either from ore or from waste material vary in purity and in adaptability to use in making certain products. The figures furnished by producers cover seven metals—copper, lead, zinc, tin, aluminium, antimony, and nickel.

The Science of Mixing and Kneading

Modern Machinery at the Bakers' Exhibition

MIXING and kneading in the making of confectionery and bread have long been regarded as operations in which the machinery employed must possess a high degree of efficiency. This was exemplified by exhibits shown at two trade exhibitions which were held in London this week.

At the Confectoners', Bakers' and Allied Traders' 37th International Exhibition (Royal Agricultural Hall, Islington, September 2—8), the display of kneading machines provided many novel features worthy of consideration in the plastics and chemical industries.



The Stand of Baker, Perkins, Ltd., at the Confectioners', Bakers' and Allied Traders' Exhibition, Royal Agricultural Hall.

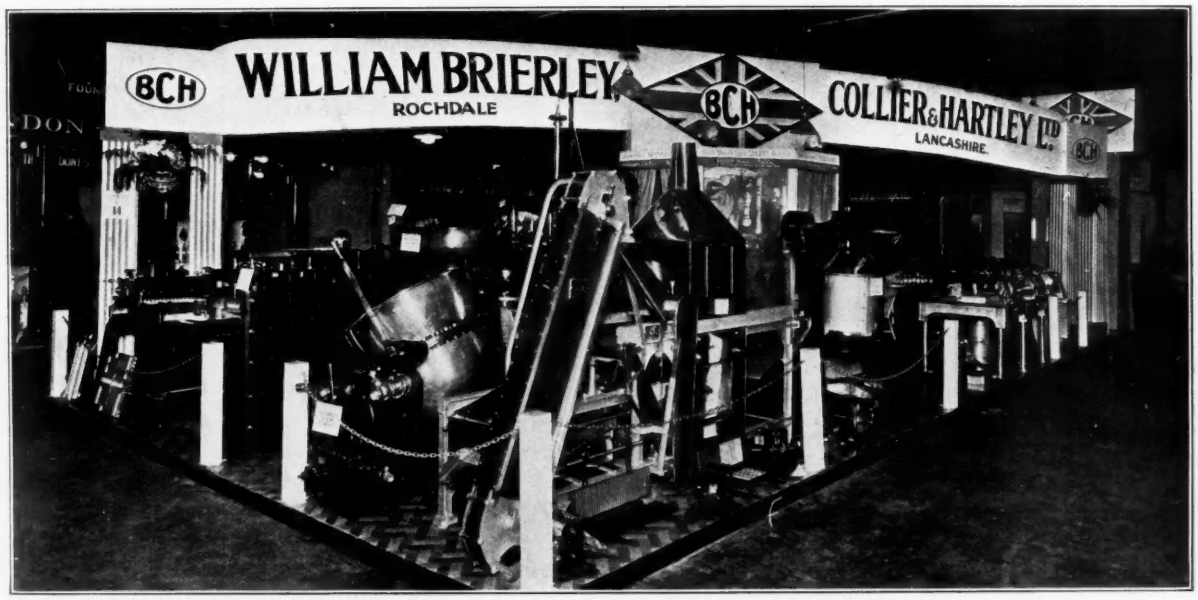
Dough is not merely a paste of flour and water puffed out by the gases of fermentaton. Actually it involves a combination of protein with water to form gluten, a subsequent mellowing and modification of this gluten so that a tasty loaf of attractive colour and texture will result, and a combination of chemical and physical actions on the dough ingredients. Accordingly, the more effectively the mixing is carried out, the more uniform will be the dough. Further, the more perfectly the gluten is developed, the higher the absorption and the better the loaf. Incident to these two functions of any dough-making machine is the incorporation of a sufficient amount of air so that fermentation will proceed in a lively manner. Combinations of similar functions is sometimes met with in the mixing of plastics and in the manufacture of pharmaceutical preparations.

A Complicated Mixing Operation

The mixing of dough is a very complicated operation. The yeast feeds on the sugars of the flour and other ingredients and in doing this the yeast enzymes change the complicated

The Dumbrill "Super-Human" Dough Mixer and Kneader: Wheel-out model.

sugars to simple ones. Incident to this process, carbonic acid gas and alcohol are produced. Some of the carbonic acid gas combines with water to form a weak solution of carbonic acid. In other ways, acetic and lactic acid are produced within the dough. All of these have their effect on



An Imposing Display of Equipment in Monel Metal and Stainless Steel at the Chocolate and Confectionery Exhibition, Olympia.

the gluten which, being assisted by other yeast, malt and flour enzymes, causes the ageing of the dough as the temperature increases. In time, the yeast absorbs all food adjacent to it and fermentation ceases, although the dough is not ripe, for all the proteins have not been acted upon. Consequently, the dough needs to be punched, so that yeast is again brought in contact with fresh food and fresh protein and the ageing process proceeds to full maturity.

In the patented mixing and kneading machine which was shown by the Artofex Engineering Works, Ltd., there is a unique action of the two mixing arms in the rotating bowl. The left-hand arm is designed in such a way that it practically touches the sides and bottom of the bowl, thus making absolutely sure that every particle of the ingredients is brought under the direct mixing action of the two arms. In operation these two arms move closely over one another in their elliptical paths, and only by such action is it possible to obtain most thorough shaking-in of flour and water, maximum gluten development and the consequent highest possible water absorption. Not only are all these ingredients perfectly blended with each other, but the triple mixing and kneading action is so thorough that in spite of its gentleness stiff doughs are obtained with unusually high water absorption. The arms of the machine give a mixing, lifting and stretching action. They are made of forged steel coated with tin; the bowl of the machine is made from sheet steel completely coated with tin of 99 per cent. purity. Grease lubrication is used.

Securing Perfect Aeration for Dough

Another novel dough-kneading machine is exhibited by Baker, Perkins, Ltd., who have also supplied their well-known helical mixing and kneading to many chemical and allied works. In this machine the revolving pan and the swan-necked mixing arm form a combination which, in action, is almost identical with that employed by an operator when making dough by hand. The dough is subjected to a very gentle treatment which consists of a pronounced and continuous stretching and folding motion, causing the whole mass to be thoroughly aerated and improved in colour and texture, while also securing a greater yield. This increase in yield is due to the fact that an addition to the liquor can be made because of the increased power of absorption rendered possible by the action of the machine. The pan is made in such a manner as to permit its detachment from the rest of the machine, and any number of pans (which are interchangeable) can be used.

Other mixers of interest are displayed at the stand occupied by Read's Mixer and Oven Co., Ltd. These machines are provided with bowls of 5 and 7½ gallons capacity, and beaters and whips to meet the all-round duties of a modern bakery—are incidentally the needs of a small-scale manufacturing laboratory. All danger of the bowl falling is eliminated by a special full-ring saddle, whilst the raising and lowering of the bowl is accomplished by the aid of a handwheel. A distinctly novel feature lays in the provision of a safety spring clip for securing the beaters in position. A sponge whisking machine, fitted with infinite variable speed device, was exhibited by the Dumbrill Plant and Engineering Co. This firm was also showing a series of dough mixers and kneaders in which perfect human action is claimed to be mechanically reproduced in the simplest possible manner.

Mixers for Heavy Duty

The "Supermixa" (Patent No. 259,058), is designed for extremely heavy work, and is a departure from the usual known types of whisking and beating machines. The usual method of speed regulation on this type of machine is through a train of gear wheels, and a gear box, three speeds only being obtainable for mixing purposes, but on the "Supermixa" a P.I.V. gear box has been incorporated and this dispenses entirely with the chain of gear wheels. It is a very scientific and simple method of obtaining infinite variable speed, whilst the machine is working, by the simple manipulation of a hand wheel. The advantage of this gear box will be most pronounced as there are many mixings which demand a particular speed, and with this unique control, any speed can be obtained. Lubrication is effected by oil bath, making it a perfectly simple machine to maintain. Whisking and mixing are obtained by the well-known "sun and planet" action, and the machine is fitted with 30 quart bowl and beaters for small quantity working, and 80 quart bowl and beaters for large quantity working. Ample power is provided in the electric motor making this machine suitable for mixing the hardest plastic substances.

The "Super Human" mixer (Patent No. 273,631), is suitable for heavy and continuous duty. The arm is a steel forging running on a roller guide, making the action very flexible; it is driven through a spur wheel and pinion on a crank motion, and the bowl is rotated by a positive worm and worm wheel drive. The bowl can be treated by deposition for any desired metallic surface. For the non-corrosive industries pure tin is a suitable lining, and the mixing arm is coated with the same substance. The action of the arm and the rotating bowl makes for a complete mixing, and the thorough amalgamation of the whole of the ingredients in the bowl.

These "Super Human" mixers have been supplied for such diverse purposes as mixing the ingredients for false teeth plates, for incorporating naphtha into soft soap, for making the plastic substance from which printing rolls are moulded, the machine being jacketed for working under heat; for the manufacture of printing inks, and many other dry and wet mixings not in any way connected with the food trade. The "Supermixa" can be used very successfully in the chemical trades for non-corrosive mixings, such as dental pastes, face creams, and anything that requires a thorough beating and mixing.

Monel Metal and Stainless Steel

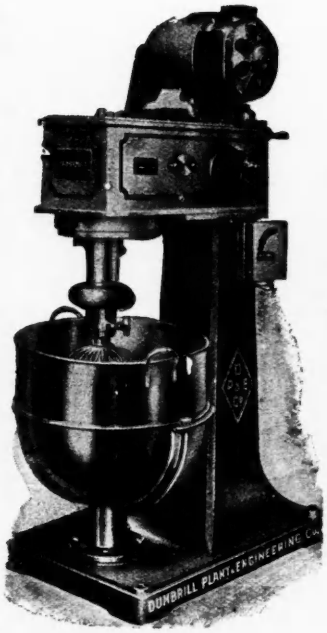
Wide application of monel metal and stainless steel in the equipment employed at chocolate works were in evidence at the 6th. Chocolate and Confectionery Exhibition (Empire Hall, Olympia, August 30—September 7). At the stand occupied by William Brierley, Collier and Hartley, Ltd., a fruit chopping machine was exhibited for the first time. This machine, which is made throughout from stainless metal, can be fed continuously, and is used for chopping or mincing fruit for various purposes. For instance, for the manufacture of jelly or marmalade it is necessary to chop up the whole orange before it is boiled with sugar, etc., and filtered. Whole oranges could be poured continuously into the hopper of this machine at the rate of one ton per hour, and the resultant fruit pulp appeared in a continuous stream through the outlet.

On this stand there was also a sugaring machine unit which fixes sugar on to gums, jellies, and hard boiled sweets, etc., at the rate of 12 to 15 tons per week. This machine is fed continuously, and delivers the goods dried and practically ready for packing. The latest model of pulping machine, made of stainless steel, is designed to remove pips, stones, stalks, etc., from various fruits such as plums, apricots, raspberries, oranges, etc. It is fitted with removable sieves or screens of various perforations for handling different types of fruit, and will remove the pips from raspberry pulp at the rate of 7 tons per hour. Other exhibits included a continuous plastic machine, experimental mixers, boiling pans, egg whisks and a crystalliser with an output of 12 tons per week.

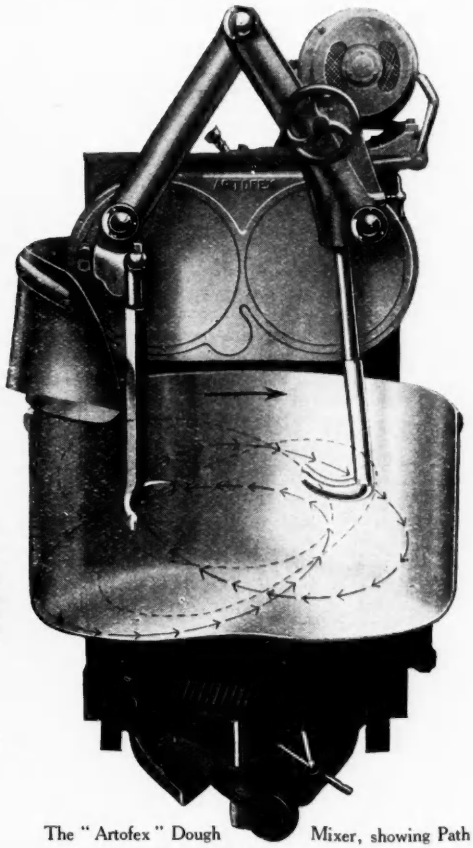
Wrapping Machines

Wrapping machines constituted the greater part of the exhibit of Baker Perkins, Ltd. A new carton wrapping machine made in two models, one being designed to heat-seal a waxed paper wrapping and another to seal parchment, kraft "Glascene" and "Cellophane" (including the moisture proof type) with their proper adhesives. Among other machines on show were a foiling and labelling machine, a Baker-Hulme crystallising plant, and a B.P. steaming and sugarine machine.

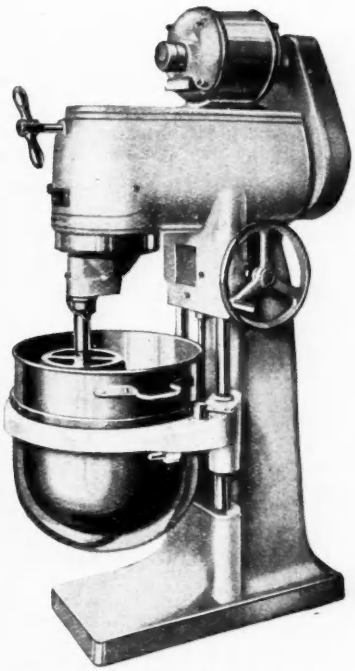
Research was featured by the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery and Jam Trades. At this stand there were also exhibits of defects in chocolate and confectionery due to careless handling by retailers, and of the raw materials of confectionery. The "research exhibits" related to the control of the browning of sugar syrups; the properties of fruit jellies; the control of fermentation of syrup, jams, etc., without the use of preservatives; and the sedimentation of cocoa as regulated by the way in which the powder is mixed with the water or milk.



The Dumbrill "Supermixa," with Infinite Variable Speed.



The " Artofex " Dough Mixer, showing Path taken by Mixing Arms.



Read's General Purpose Mixer, with 1 h.p. Electric Motor and Starter.

A Battery of " Artofex " Dough Mixing and Kneading Machines at Hull.

Chemical Notes from Overseas

Solid Carbon Dioxide in Australia

THERE are two firms manufacturing solid carbon dioxide in Australia—The Colonial Sugar Refining Co., Ltd., with a plant in Sydney, and the Carba Dry Ice (Australia), Ltd., Abbotsford, Victoria. It is reported that the Colonial Gas Association, Ltd., Melbourne, has purchased the patent rights for the Carba process for the State of Queensland and contemplates production late this year from a plant at Brisbane.

Austrian Production Maintained

CHEMICAL sales in Austria during the first half of 1933 were on about the same level as last year. Exports are suffering from foreign exchange restrictions in neighbouring countries. The demand for fertilisers was satisfactory, but turnover and prices of the local industry were unfavourably affected by the duty-free importation of 1,500 tons of potassium ammonium nitrate from Hungary. Austrian stocks on hand of ammonia sulphate were estimated at 5,000 tons, which represent approximately the local requirements for one year.

French Foreign Trade

THE foreign trade of France so far in 1933 shows a somewhat different trend from that of its leading competitors inasmuch as imports valued at approximately £5,200,000 at par for the first four months of the current year exceed the imports of the corresponding period of 1932 by nearly £400,000. Exports, however, valued at £3,500,000, are considerably smaller. The increases in imports were spread quite generally throughout the numerous items comprising the chemical trade, but some of the most important classes to record large quantity gains were copper sulphate, potassium carbonate, titanium pigments, coal tar pitch, tartaric and citric acids, urea, synthetic resins and carbon black.

An English Firm's Enterprise in Canada

HALL'S (CANADA), LTD., a subsidiary of the Hall Chemical Co., of London, has established a new chemical industry in Montreal by the acquisition of 43,000 sq. ft. of property, with buildings, railway siding, and a wharf on the Lachine Canal, for the purpose of manufacturing chemical products. The new company's principal product will be a rust preventative in liquid and semi-liquid form which is used by machinery makers in this country for automobiles, steamships, and locomotives. Other products which the new firm will manufacture are disinfectants, a boiler-cleaning compound, refractories, iron cement, and case-hardening materials. Many of the solid chemicals used in the manufacturing process will be imported from England, and the Canadian plant will also be given certain of the export trade now handled from England, such as the British West Indian and South American market. When in full operation, the plant should give employment to about 140 men.

Market for Asbestos in Japan

THE market in Japan for asbestos fibre, as well as for packing and other forms of manufactured articles, is increasing year by year owing to the expansion of industrial plants using this material, and to the great variety of uses to which asbestos products are being put in every-day life. Crude asbestos is manufactured locally into roofing slate, millboards, packings, yarns, etc. In competition with these, manufactured goods consisting primarily of yarns, boards, steam packing, brake and clutch linings, and roofing materials are being imported but in declining quantities. At one time 80 per cent. of the domestic imports of asbestos fibre came from Canada, a smapll percentage from Russia, and the balance was brought in through the medium of one or two English concerns who are interested in the African deposits. Statistics show that this condition has now changed, and that while Canada in 1932 still led other countries as a source of supply, in comparison with 1931, shipments from the Dominion show a decrease of 6.4 per cent., while those from the United States show an increase of 12.4 per cent. It is estimated that about 3½ per cent. of the total imports of fibre consists of long or spinning fibre, and that at the moment there is a considerable stock of short fibre held in Japan by one of the leading importers owing to abnormal imports during the first part of the year.

Copal Gum Trade

ARRIVALS of gum from the Belgian Congo during June, according to trade estimates, amounted to only 379 metric tons, as against 1,046 metric tons for May, and 884 metric tons in June, 1932. Exports of gum from Antwerp during April amounted to 758 metric tons, as compared with 640 metric tons for April, 1932, and brought down total exports for first 4 months of 1933 to 3,906 metric tons, in contrast with 4,561 metric tons for the corresponding months of 1932.

More Alcohol in Czechoslovak Motor Fuel

DURING May, 1933, 53,500 hectolitres of motor alcohol were sold in Czechoslovakia, compared with 42,700 hectolitres in April, according to a recent report. It is expected that the figures for the summer months will show still greater sales. The peak was reached in September and October, 1932, when 56,000 and 56,290 hectolitres, respectively, were sold. Czechoslovak agrarian interests favour raising the alcohol content in the Czechoslovak fuel gasoline from 20 to 25 per cent. At the same time, agrarian interests are negotiating for higher alcohol prices, which will mean a further advance in the fuel mixture price. The new prices are scheduled to become effective on September 1.

Proposed Nitrogen Control in Spain

THE report of the Spanish nitrogen commission recently made public, propose that the State promote nitrogen production in sufficient quantities to supply the entire domestic demand. Imports would be subject to control and permits issued only upon presentation of evidence that a proportionate quantity of national products had been previously acquired. Sales prices for imports would include a tax to compensate domestic producers. Considerable criticism of the project has been raised. Spanish buyers of nitrogen have enjoyed prices lower than those obtained in price-controlled European markets, and the new plan contemplates a maximum sales price equivalent to 25 per cent. over the average prices governing in the interior of Germany, France and Italy. If the plan should become effective, prices of nitrogen to farmers would increase 65 per cent.

Improvements in German Barytes Trade

PRODUCTION of barytes in Germany, after falling steadily for several years, has shown signs of improvement in recent months which, if continued, may cause an increase in total German output this year for first time since 1929. Until this year the outlook of the German industry was rendered unfavourable not only by the heavy decline in world demand but also by the existence of stocks, principally in the hands of consumers. These stocks, however, were heavily drawn upon last year and are now believed to be reduced to current needs. Moreover, after an unsatisfactory year in 1932, when German lithopone exports dropped to 11,000 tons from 18,100 tons in 1931, the German lithopone industry has been making a better showing this year, thus increasing the demand for barytes. German exports of lithopone in the first four months this year advanced to 4,000 from 3,600 tons in the same period of 1932.

German Nitrogen Price Uncertainty

THE new German domestic price list for nitrogenous fertilisers, which the German Nitrogen Syndicate customarily issues each year before July 1, has not yet been published and is being withheld pending the results of an official inquiry regarding the prices proposed by the syndicate. In the meantime, all sales by the syndicate are being billed tentatively under the price levels and sales conditions for July, 1932, with the understanding that any necessary adjustment required by the Government's findings will be made later on. The delay in issuing the new price schedule for nitrogen is indicative of the control the Government intends to enforce on German business, especially the regulation of prices charged by trusts. The wide disparity in prices of German fertilisers as charged in the domestic and foreign markets, to the disadvantage of German farmers, has long been a subject of sharp criticism, and heretofore but slight satisfaction has been granted to the farmers' demand for price reduction.

Coal Liquefaction in Germany

The Future Outlook

DISCUSSING the future of German coal liquefaction, in the course of a lecture reported in the "Chemische Industrie," September 2, Dr. Pier expressed the opinion that direct pressure liquefaction of raw brown coal and coal (Steinkohle) is by far the most satisfactory of all the several methods available for the establishment of a home liquid fuel industry. Close consideration of the alternative sources of motor fuel, including hydrogenated coal tar and brown coal tar, by-product benzene from coke ovens, and German petroleum, forces home the conclusion that none of them possess the economic and technical advantages of the raw solids.

From a brief account of the present hydrogenation technique employed by the I.G. Farbenindustrie, elaborated from experiments steadily conducted since 1924 at the Ludwigshafen laboratories, it appears that the original Bergius process, which operated without a catalyst and gave a poor yield, has now been replaced by a catalytic process which ensures rapid and adequate combination with hydrogen. The first large experimental works plant to apply the catalytic method was erected at Leuna in 1927. The Leuna works now utilises brown coal as the raw material for liquefaction, after successive large scale tests of the suitability of brown coal tar and German crude petroleum had demonstrated its superiority. Extensions to the existing hydrogenation plants are contemplated which will result in a very considerable increase in output.

The lecturer also touched upon the promising outlook for coal (Steinkohle) liquefaction processes which have now reached a satisfactory stage of development. Since one million tons of motor spirit can be derived from 3.5 million tons of German coal which only represents about 2.5 per cent. of the present annual German coal output, there is good reason to believe that Germany's liquid fuel requirements could be covered to a large extent from this source alone. Taking into account the ample supplies of brown coal and other raw materials for liquefaction, Germany may eventually become independent of liquid fuel supplies from abroad.

Chemical Workers' Demands

Forty-Hour Week and Higher Wages

A PROGRAMME for reduced working hours and increased pay for drug and fine chemical workers was approved by a national conference of factory stewards held in London on September 3 to consider in detail draft terms of a new national wages and conditions agreement recently drawn up by the Executive Council of the Chemical Workers' Union at the request of a national conference held in April.

The principal changes embodied in the suggested new agreement are:—Hours, 40 (instead of 48); overtime, 1½ time (instead of 1¼ time for first two hours and 1½ time afterwards); holiday, 12 days (instead of 6); wages, men—grade 1, 80s. (instead of 60s.); grade 2, 70s. (instead of 50s. and 55s.); women—grade 1, 40s. (instead of 34s.); grade 2, 35s. (instead of 28s. 6d.); elimination of second-grade males, workers reclassified grade 1 (60 per cent. of male workers affected); restriction of junior labour to one per four adults; payment of full wages during sickness, and compensation to workers, based on years of service, when discharged owing to reorganisation.

A statement issued by the union says that 162 stewards attended the conference, representing sixty-seven of the principal firms in the trade employing in the aggregate more than 20,000 workers—in factories operating in London, Manchester, Liverpool, Birmingham, Bristol, Coventry, Leeds, Derby, Edinburgh, Glasgow, Nottingham, Newcastle and Sheffield—likely to be affected by the proposed new terms. The conference endorsed the executive council's draft, and by resolution pledged itself to take all possible steps to prevail on all members in the impending national ballot to vote in favour of authorising the executive council to submit these new terms direct to all firms by whom union members are employed with a view to their early adoption and operation. Union rules demand a 75 per cent. majority of members involved to approve before such action can be taken.

Maple Sugar Production

Late and Short Season in Canada

ACCORDING to the Dominion Bureau of Statistics at Ottawa, the estimated production of maple sugar in Canada during the past spring season is 5,785,130 lb. valued at $499,713, whilst 1,262,315 gal. of maple syrup were also produced with a value of $1,559,628. The season was generally late and short in the Maritime Provinces, and the flow of sap was also curtailed in Ontario and Quebec. The natural range of the sugar maple in Canada extends from the Maritime Provinces to the lake of the Woods in Ontario. In the forest it may reach a height of over 100 ft., but ordinarily does not average more than 75 to 80 ft. in height and 2 to 3 ft. in diameter. It occurs either in pure stands or it is found associated with other hardwoods. It is very tolerant of shade, and this ability enables it to reproduce and survive in competition with other species.

Canadian Soya Bean Crop

Experiments in Manitoba

A SPECIAL committee of the Winipeg Board of Trade arranged for the cultivation this year of 100 acres with soya beans, to be sown in 2-acre plots on 50 farms. There have been evidences recently of a growing interest in various parts of Canada in the culture of soya beans. In Ontario, particularly, farmers are raising the crop for forage purposes and in the vicinity of Chatham a start was made in the spring of 1932 in the culture of the beans for the expression of oil. A farmers' co-operative organisation was formed and machinery installed in a mill at Chatham for the production of soya bean oil and soya bean meal.

A recent report stated that the Soya Bean Co-operative of Chatham would have 200,000 bushels of soya beans for the new oil extraction plant. The co-operative venture of Chatham, Ontario, is the first commercial attempt in Canada to grow the beans as the basis of an oil and meal industry and expectations for success are founded on the large importations of vegetable oils for various industries including soap and paint manufacturing and production of edible oils.

Analysis of Fertilisers

Birmingham City Analyst's Report

MR. H. H. Bagnall, the Birmingham City Analyst, states in his annual report for 1932 that during the year ten samples of feeding stuffs and fourteen samples of fertilisers were analysed for the Agricultural and Small Holdings Committee which administers the Fertilisers and Feeding Stuffs Act, 1926. The feeding stuffs included three samples of Sussex ground oats, two of fish meal, two of meat and bone meal, and one each of meat meal, laying meal, and biscuit meal. An analysis was supplied with one sample of meat and bone meal, but the actual composition differed widely from that given. As it seemed likely that some unintentional error had been committed a fresh sample was purchased from the same vendor. The same analysis was supplied but on this occasion the actual composition agreed with it within the statutory limits of error. The fertilisers included four samples of compound fertiliser, four of bone meal, three of sulphate of ammonia, and one each of blood and bone manure, nitrate of soda, and hop manure. One sample of bone meal was accompanied by a statement giving the phosphoric acid in terms of phosphate of lime instead of phosphoric anhydride as required by the Act and the vendor was cautioned. Another sample of bone meal was similarly sold with a statement which included the item "Nitrate 3.7 per cent," but the Act requires that the term used should be "nitrogen" and the vendor was accordingly cautioned.

A NEW procedure has been devised for the purification of enzymes, using specific anti-enzymes as precipitants. According to J. Stanley Kirk ("Jour. of Biol. Chem.," 1933, C. 667-670) the urease of the soya bean was precipitated from aqueous extracts of that bean by the addition of highly urified antiurease. Washing the precipitate with 0.4 per cent. sodium chloride solution removes the antiurease.

News from the Allied Industries

Tanning

A COMMITTEE OF BUSINESS PEOPLE are making arrangements for the erection of a tannery on modern lines at Haschetstown, Irish Free State. Experts have reported favourably on the prospects of the industry, and have selected a suitable site. It is anticipated that the initial capital will be about £20,000.

China Clay

THE ACCOUNTS OF LOVERING CHINA CLAYS, LTD., for the year ended March 31, 1933, cover trading operations for the first half of that period only. This is due to the amalgamation with English China Clays, Ltd. and H. D. Pochin and Co., Ltd., which took effect from October 1. Profits of the Lovering Company are now mainly derived from dividends on investments from which, so far as the assets sold now take this form, no return could be expected during the second half of the year under review. Accounts are slightly more favourable than those for the preceding year, although operations have again been conducted at a loss. The net deficit for the year is £9,797, which increases the debit balance on profit and loss account to £28,765. For the previous year a loss of £11,250 was recorded.

Carbonisation

PROFESSOR GEORGE KNOX addressed a conference of Monmouthshire local authorities at Pontypool last week, on the possibilities of developments in South Wales and Monmouthshire in connection with the extraction of oil from coal. He declared that there seemed to be no doubt but that the Eastern Valley of Monmouthshire must have a large part of any low temperature carbonisation plant set up because the area had suitable coal. As far as the hydrogenation process was concerned, there were the factors of big gasworks and coke ovens to be considered and plant would have to be centrally situated—probably in the vicinity of Newport or Cardiff. Mr. W. G. Phillips (Llantarnam Council) said that if Imperial Chemical Industries thought of doing for South Wales what they had done in the North of England there was a site available in the Eastern Valley of a chemical works which had been close to the docks had possessed good siding accommodation.

Iron and Steel

AS A RESULT OF THE IMPROVEMENT in trade the Siegerland plants of the Vereinigte Stahlwerke, Germany, have recently increased their personnel from 3,800 to 6,700. Among the other iron and steel concerns which have re-engaged considerable numbers of workers during recent months may be mentioned the Deutsche Edelstahlwerke, which has been able to re-engage some 700 workers, bringing the total number of its employees to approximately 2,300. This increase in personnel is almost entirely attributable to an improvement in the volume of domestic trade.

Beet Sugar

THE IRISH SUGAR MANUFACTURING CO., LTD., has announced an extraordinary general meeting for September 18 to consider a resolution, approved by the directors, entering into a contract with the Free State Ministry of Agriculture for the sale of the assets of the company. The Government subsidy for the company is due to be continued for three years, and the present action is due to the formation by the Government of a new company to control the three new factories to be erected. The present factory controlled by the company is in Carlow. The directorate is composed of Belgian beet-sugar experts and Irishmen.

Artificial Silk

BRITISH OUTPUT OF RAYON YARN and waste in July reached a high record of 7,630,000 lb., as compapred with 6,680,000 lb. in June. The average monthly production in the first quarter of 1933 was 6,000,000 lb., and in the second quarter 6,330,000 lb.

FOLLOWING REPRESENTATIONS BY MANUFACTURERS, the German Minister of Commerce proposes to allow members of the German rayon cartel to denounce their cartel agreement without notice. These proposals are said to be justified on the grounds that it is necessary to redress the balance of Germany's trade. The Minister of Commerce points out that he sees no reason why 40 per cent. of the German consumption of artificial silk should be imported.

Solid Hydrogen Peroxide

A Recent German Patent

THE double compound of urea and a substance of the type of glucose ureide has been found to take up a much higher proportion of hydrogen peroxide than glucose ureide alone. According to a recent German patent (No. 580,710) on mixing 22 parts of glucose ureide with 3 parts of 30 per cent. hydrogen peroxide and drying the pasty mass at the lowest possible temperature, a product is obtained with a hydrogen peroxide content of 1.5 to 2 per cent. On the other hand, a solid preparation formed on heating 22 parts of glucose ureide with 6 parts of urea and 10 parts 30 per cent. hydrogen peroxide contains 9 per cent. of hydrogen peroxide. Further stability can be imparted by incorporating an acid or an acid salt.

Wood Preservation

A New German Process

TREE trunks intended for use as telegraph poles and the like can be stored during the preliminary drying period without danger of deterioration from parasitic action, if coated immediately after filling and removal of the bark with a paste of water and binding agent in admixture with intensely active protective agents ("Chemische Fabrik," August 16, 1933, page 345). Since penetration of the latter to the requisite depth below the surface of the wood depends upon osmotic action, excessive evaporation of the water necessary for this purpose is prevented by covering the treated wood with roofing board or other suitable material. Several weeks elapse before the entire sap wood is impregnated with the salts. By a modification of the process, the salts are introduced in the living tree at a suitable point above the root, a portion being subsequently carried upwards with the sap.

Petrol from Indian Coal

Research at Calcutta

RESEARCH with a view to manufacture petrol from coal was advocated by Mr. K. Dutt while presiding at the annual meeting of the Geological, Mining and Metallurgical Society of India, in Calcutta. He calculated that there were nearly 210,000 motor vehicles in India out of which 21,000 were in Burma, and taking the average annual consumption of each motor vehicle as 400 gallons, the present need of pretrol in India excluding Burma would amount to about 76,000,000 gallons. If the rapid increase in the number of vehicles is taken into account, it will not be long before India will require about 100,000,000 gallons for motor car consumption alone. Mr. Dutt suggested the appointment of a Fuel Research Board to carry out the necessary research.

Bombay Trade in Dyes

Marked Fall in Imports

THE report of the sea-borne trade of Bombay for 1932-33 shows that imports of dyeing and tanning substances during the year amounted to Rs.166 lakhs in value as against Rs.185 lakhs in the previous year. The quantities imported show a more marked falling off but the preference shown particularly in Ahmedabad mills, for more concentrated and costly dyes has resulted in smaller decrease in value. Germany's share in the total imports declined from 66 to 51 per cent. Imports of alizarine dyes declined from 2,031,600 lb. to 1,440,000 lb., the supplies from both Germany and the United Kingdom being smaller. Imports of aniline dyes also declined from 10,600,000 lb. to 6,900,000 lb. Arrivals from Germany chiefly fell away from 7,700,000 to 3,900,000 lb. but those from the United Kingdom improved from 1,018,000 to 1,216,000 lb.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Application

REFINED VEGETABLE PRODUCT AND PROCESS OF MAKING SAME.—M. Bonotto. Nov. 20, 1931. 397,482.

CONVERSION OF COAL DISTILLATION PRODUCTS, PARTICULARLY TAR ACIDS OR PRODUCTS CONTAINING SAME, INTO VALUABLE HYDROCARBONS SUBSTANTIALLY FREE FROM TAR ACIDS.—C. J. Greenstreet, Jan. 18, 1932. 397,468.

PROCESS FOR MAKING AMMONIUM SULPHATE NITRATE.—Gewerkschaft Victor. Feb. 5, 1931. 397,532.

PRODUCTION OF COLOURATIONS ON TEXTILE MATERIALS MADE OF OR CONTAINING CELLULOSE ESTERS.—British Celanese, Ltd., and G. H. Ellis. Feb. 10, 1932. 397,470.

PRODUCTION OF COLOURATIONS ON MATERIALS MADE OF OR CONTAINING ORGANIC DERIVATIVES OF CELLULOSE.—British Celanese, Ltd., H. C. Olpin and G. H. Ellis. Feb. 17, 1932. 397,534.

REMOVAL OF AMMONIA FROM FUEL GAS.—Koppers Co. of Deleware. Jan. 13, 1932. 397,537.

CONDENSATION REACTIONS.—A. Carpmael (Schering-Kahlbaum Akt.-Ges.). Feb. 19, 1932. 397,505.

MANUFACTURE OF ALIPHATIC ANHYDRIDES.—H. Dreyfus. Feb. 22, 1932. 397,472.

DEHYDRATION OF ELECTROLYSABLE SALTS OF EASILY OXIDISABLE METALS.—Johnson, Matthey and Co., Ltd. Feb. 20, 1931. 397,479.

PROCESS FOR REMOVING ALBUMINOUS SUBSTANCES FROM THERAPEUTIC SERA AND OTHER LIQUIDS.—Dr. S. G. T. Bendien. March 2, 1931. 397,515.

SEPARATION OF GASES FROM LIQUIDS.—Anglo-Persian Oil Co., Ltd., and A. C. Hartley. Feb. 26, 1932. 397,540.

COATING COMPOSITIONS.—E. I. Du Pont de Nemours and Co. Feb. 27, 1931. 397,554.

ESTERIFICATION OF CELLULOSE.—Dr. G. Jayme. June 30, 1931. 397,638.

PURIFICATION OF MAGNESIUM CHLORIDE.—Johnson, Matthey and Co., Ltd. Feb. 20, 1931. 397,481.

PRODUCTION OF ARTIFICIAL RESIN FROM RESITE MASSES CONTAINING A CELLULOSE FILLING MATERIAL.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Oct. 12, 1931. 397,690.

MANUFACTURE OF MONOAZO DYESTUFFS.—W. W. Groves (J. R. Geigy Akt.-Ges. Oct. 17, 1932. 397,693.

MANUFACTURE OF ARTIFICIAL RESINS AND RESINOUS PRODUCTS.—Standard Oil Development Co. Oct. 30, 1931. 397,699.

BENZYL CELLULOSE COMPOSITIONS.—L. Light. Feb. 16, 1933. 397,773.

PROCESS FOR PURIFYING ORGANIC ACID CHLORIDES.—W. W. Groves (Monsanto Chemical Works). Feb. 21, 1933. 397,775.

Complete Specifications Open to Public Inspection

PROCESS FOR THE MANUFACTURE OF POTASSIUM NITRATE.—Norsk Hydro-Elektrisk Kvaelstofaktieselskab. Feb. 23, 1932. 16243/32.

PROCESS FOR THE PRODUCTION OF POTASSIUM NITRATE AND CALCIUM CHLORIDE.—Norsk Hydro-Elektrisk Kvaelstofaktieselskab. Feb. 23, 1932. 16244/32.

PRODUCTION OF SODIUM CYANIDE.—Ges. für Kohlentechnik. Feb. 26, 1932. 5348/33.

MANUFACTURE OF COLLOIDAL SULPHUR.—E. I. Du Pont de Nemours and Co. Feb. 23, 1932. 5422/33.

MANUFACTURE OF ANTHRAQUINONE DERIVATIVES.—I. G. Farbenindustrie. Feb. 23, 1932. 5556/33.

PRODUCTION OF RUBBER HAVING AGEDRESISTING PROPERTIES.—E. I. Du Pont de Nemours and Co. Feb. 26, 1932. 5658/33.

PROCESS FOR THE MANUFACTURE OF RUBBER SOLUTIONS AND OF RUBBER CONVERSION PRODUCTS THEREFROM.—I. G. Farbenindustrie. Feb. 255, 1932. 5698/33.

PROCESS FOR THE MANUFACTURE OF ALKALI METAL HYDROXIDE SOLUTIONS.—I. G. Farbenindustrie. Feb. 25, 1932. 5821/33.

MANUFACTURE OF INTERMEDIATE PRODUCTS AND DYESTUFFS THEREFROM.—Soc. of Chemical Industry in Basle. Feb. 25, 1932. 5900/33.

MANUFACTURE OF AZO DYESTUFFS.—I. G. Farbenindustrie. Feb. 27, 1932. 5901/33.

MANUFACTURE OF OXALIC ACID AND ESTERS THEREOF.—E. I. Du Pont de Nemours and Co. Feb. 27, 1932. 5931/33.

Applications for Patents

PRODUCING FAST TINTS ON ANIMAL FIBRES.—Soc. of Chemical Industry in Basle. Aug. 14. (Switzerland, Aug. 19, '32.) 22649.

MANUFACTURE OF DURABLE PASTES FROM ENDOSPERMS OF SEEDS OF CAROB TREE, ETC.—Tres Chemisch-Pharazeutische Industrie und Handels A.G. Aug. 15. (Austria, Aug. 26, '32.) 22798.

MAKING RUSTLESS IRON.—Alloy Research Corporation. Aug. 22. (United States, Aug. 23, '32.) 23335.

DENITRATION OF ARTIFICIAL NITROCELLULOSE SILK.—E. Bery. Aug. 23. 23433.

MANUFACTURE AND USE OF ORGANIC ETHERS.—British Celanese, Ltd. Aug. 23. 23441.

VAT DYE PRINTING PASTES.—H. P. Brown, R. F. Goldstein and Imperial Chemical Industries, Ltd. Aug. 21. 23255.

DISTILLATION FOR PRODUCTION OF VOLATILE METALS.—H. E. Coley. Aug. 25. 23675.

OBTAINING SOLUTIONS OF BERYLLIUM FLUORIDE.—Compagnie de Produits Chimiques et Electrométallurgiques Alais, Froges, et Camargue. Aug. 23. 23452.

CATALYTIC HYDRATION OF OLEFINES, ETC.—Distillers Co., Ltd., J. B. Dymock, W. P. Joshua and H. M. Stanley. Aug. 24. 23562.

MANUFACTURE OF FUNGICIDAL, ETC., MATERIALS.—E. I. Du Pont de Nemours and Co. Aug. 21. 23256.

MOTOR FUEL OILS.—E. I. Du Pont de Nemours and Co. Aug. 24. 23557.

MANUFACTURE OF MORDANT DYESTUFFS.—Durand and Huguenin. Aug. 24. 23564.

REACTIONS WITH CHROMATE IONS.—Harshaw Chemical Co. Aug. 24. 23534.

VAT AND SULPHUR DYESTUFF PREPARATIONS FOR TEXTILE PRINTING. I. G. Farbenindustrie. Aug. 25. 23693.

FUEL OIL.—Imperial Chemical Industries, Ltd. Aug. 21. 23253, 23254.

DYEING ANIMAL FIBRE.—J. Y. Johnson (I. G. Farbenindustrie). Aug. 24. 23542.

MANUFACTURE OF HYDROCARBON PRODUCTS.—J. Y. Johnson (I. G. Farbenindustrie). Aug. 25. 23685.

MANUFACTURE OF FERTILISERS.—E. L. Pease. Aug. 21. 23257.

ANODIC TREATMENT OF METALS.—W. J. Rickets. Aug. 24. 23597.

PREPARATION OF SYNTHETIC LACS.—Soc. des Laques et Matières Plastiques. Aug. 22. (France, Aug. 23, '32.) 23342.

CATALYTIC HYDRATION OF OLEFINES.—H. M. Stanley. Aug. 24. 23562.

MANUFACTURE OF SULPHONATION PRODUCTS.—W. J. Tennant (Henkel et Cie). Aug. 26. 23771.

DISTILLATION OF TAR, ETC.—T. O. Wilton. Aug. 26. 23776.

PRODUCTION OF 1-(3^1, 4^1, 5^1-TRIALKOXY-PHENYLI-6, 7-DIALKOXY-ISOQUINOLINES.—Asta A.-G. Chemische Fabrik. Aug. 29. (Germany, Aug. 29, '32.) 23985.

MAKING THIN CELLULOSE HYDRATE FILMS, ETC.—J. P. Bemberg A.-G. Sept. 1. (Germany, Sept. 3, '32.) 24281, 24282.

PRODUCTION OF SYNTHETIC RESINS, AND COATING COMPOSITIONS CONTAINING SAME.—M. M. Brubaker and E. I. Du Pont de Nemours and Co. Aug. 31. 24167.

SULPHATING NON-FERROUS METALS CONTAINED IN FERRUGINOUS SULPHIDE ORES, ETC.—C. P. Debuch. Aug. 29. 23958.

MANUFACTURE OF ORGANIC MERCURY COMPOUNDS.—P. W. Denny and Imperial Chemical Industries, Ltd. Aug. 30. 24057.

FLUORINATION OF ORGANIC COMPOUNDS.—E. I. Du Pont de Nemours and Co. Aug. 28. (United States, Sept. 10, '32.) 23839.

INSECTICIDE, ETC., COMPOSITION.—J. Ferguson and Imperial Chemical Industries, Ltd. Aug. 30. 24054, 24055.

PRODUCTION OF FUEL BY LOW TEMPERATURE CARBONISATION OF COAL.—Fife Coal Co., Ltd., G. S. Jenkins and W. Reid. Sept. 1. 24269.

PRODUCTION AND APPLCATION OF OZONE.—E. Fisch. Aug. 31. (Switzerland, July 29). 24209.

MANUFACTURE OF COMPOUNDS FOR PROTECTION AGAINST MOTHS.—J. R. Geigy A.-G. Aug. 29. 23944, 23945, 23946, 23947, 23948, 23949.

MANUFACTURE OF WETTING, ETC., AGENTS.—J. R. Geigy A.-G. Aug. 31. 24173, 24174, 24175, 24176, 24177, 24178, 24179, 24180, 24181, 24182, 24183, 24184, 24185, 24186, 24187, 24188, 24189.

MANUFACTURE OF WETTING, ETC., AGENTS.—J. R. Geigy, A.-G. Sept. 1. 24299, 24300, 24301.

Forthcoming Events

Sept. 12—15.—Iron and Steel Institute. Autumn meeting. University, Sheffield.

Sept. 18—21.—Institute of Metals. 25th Autumn Meeting. Birmingham.

Sept. 22.—Institute of the Plastics Industry (Midland Section). "Plastics—since 1905, Some Personal Reflections." Wm. C. Waghorne. Imperial Hotel, Temple Street, Birmingham.

Sept. 28.—Institute of Fuel. Visit to Battersea and Barking new Power Stations.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THE following market report is based on information supplied by the British manufacturers concerned, and unless otherwise qualified the figures quoted apply to fair quantities, net and naked at makers' works. Where no locality is indicated, the prices are general for the United Kingdom. Particulars of the London chemical market are specially supplied to THE CHEMICAL AGE by R. W. Greeff and Co., Ltd., and Chas. Page and Co., Ltd., and those of the Scottish chemical market by Chas. Tennant and Co., Ltd.

THE market in chemical products has been rather quiet during the week, the slackening influence of the holiday period still being felt to some extent. Exchange fluctuations are also responsible for the uncertainty in forward business. Quoted prices for industrial chemicals have remained steady, a satisfactory demand generally being reported. Competition has been more active for large consignments of acetone and formaldehyde than in any other direction. Alum, formic acid and small orders for anhydrous ammonia have been prominent in a lesser degree. Coal tar products have been in greater demand, but prices generally have not been affected. The weakest spot in this group was pitch; toluol and xylol remaining steady. Dullness in the industrial market was most noticeable in caustic potash, potassium chlorate and sodium sulphide. As regards pharmaceuticals, the prevalence of small orders continue. Slackness has continued in salicylic acid and salicylates. Limited demand has rendered the market for essential oils irregular. Bromides and hydroquinone have received greater attention, and on a moderate scale aspirin and benzoic acid were more active. A rise in the price of bismuth salts was consequent on higher quotations for the raw material. In the nitrogen fertiliser market it is reported that fair quantities of sulphate of ammonia are being booked for forward, but there is little interest for prompt delivery. The export market is also quiet.

LONDON.—The London market has received a fair volume of inquiry during the past week and the amount of actual business booked is also well up to average. Markets continue steady with prices for imported products firm and tending to advance owing to the exchange influence. There is a much firmer tendency in the lead acetate market and the price is inclined to harden. There is no change to report in the coal tar products market from last week, prices remaining firm and unaltered.

MANCHESTER.—Business in chemicals on the Manchester market tends to expand a little now that the holiday season is approaching its end, and a satisfactory feature is the resumption of contract deliveries on something like the normal scale to the textile finish and dyeing industries. At the moment, however, there is no contract buying of any magnitude and most users are content to cover near requirements. Steadiness of prices is still in evidence in most sections.

SCOTLAND.—Prices generally have remained standard and practical business has been rather limited. There are no outstanding transactions to report in any heavy chemicals, although xylol has become scarce. Pitch is now at the very low level of 80s. per ton f.o.b. in bulk. The price is likely to remain unaltered and tar prices also will remain at the same level. Creosote oil prices are very low at the present time, but are likely to stiffen in the immediate future as other uses are now being found for this product.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80% £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND: Granulated commercial, £26 10s. per ton; B.P. crystals, £35 10s.; B.P. powder, £36 10s. in 1-cwt. bags d/d free Great Britain in 1-ton lots upwards.

ACID CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—LONDON: 9½d. per lb.; less 5%. MANCHESTER: 9¾d.

ACID, CRESYLIC.—97/99%, 1s. 1d. to 1s. 7d. per gal.; 98/100%. 1s. 5d. to 2s.

ACID, FORMIC.—LONDON: £47 10s. per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 7s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £49 to £52 ex store. MANCHESTER: £48 to £54 ex store.

ACID, SULPHURIC.—Average prices f.o.r. British makers' works, with slight variations owing to local considerations; 140° Tw. crude acid, £3 per ton; 168° Tw. arsenical £5 10s.; 168° Tw. non-arsenical, £6 15s. SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—LONDON: 11d. per lb. SCOTLAND: B.P. crystals, 11d., carriage paid. MANCHESTER: 11¾d.

ALUM.—SCOTLAND: Lump potash, £9 per ton ex store.

ALUMINA SULPHATE.—LONDON. £8 5s. to £9 10s. per ton. SCOTLAND: £8 to £8 10s. ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £32 per ton; powdered, £34, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £19 to £20. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £17 c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 10s. at mines.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot 35/37% £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 15s. in 5/6 cwt. casks.

BORAX, COMMERCIAL.—Granulated, £15 10s. per ton; powder, £17 packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—2s. 9d. to 3s. 1d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3¼d. to 4¾d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£41 to £46 per ton, drums extra.

CHROMIUM OXIDE.—10½d. per lb., according to quantity d/d U.K. Green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb. Liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 per cwt.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £28 per ton. SCOTLAND: 40%, £28 ex store.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £35 per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD NITRATE.—£28 per ton.

LEAD, RED.—SCOTLAND: £25 10s. to £28 per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND: Ground Calcined £9 per ton ex store.

METHYLATED SPIRIT.—61 O.P. Industrial 1s. 8d. to 2s. 3d. per gal. Pyridinised Industrial, 1s. 10d. to 2s. 5d. Mineralised, 2s. 9d. to 3s. 3d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—9d. to 10d. per lb. nominal.

POTASH, CAUSTIC.—LONDON: £42; MANCHESTER: £41.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5¾d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100% powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND: Refined Granulated £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.
POTASSIUM PERMANGANATE.—LONDON: 8½d. per lb. SCOTLAND: B.P. crystals, 8½d. MANCHESTER: Commercial, 8½d., B.P. 8½d.
POTASSIUM PRUSSIATE.—LONDON: 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8½d.
SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d in barrels.
SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags, special terms for contracts.
SODA, CAUSTIC.—Solid 76/77° spot, £14 5s. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 15s. in casks, Solid 76/77%, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 10s. contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON: £23.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 10s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. with discounts for quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. less 1 to 3½% contracts, 4d. spot lots.
SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 per ton.
SODIUM CHROMATE.—3⅝d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.
SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£12 10s. per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.
SODIUM SILICATE.—140° Tw. Spot £8 5s. per ton d/d station, returnable drums.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground Spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £17 per ton f.o.b.
SULPHUR.—£11 10s. per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9; ground American, £10 ex store.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 3d. to 4s. 5d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON AND SCOTLAND: £12 per ton.
ZINC SULPHIDE.—11d. to 1s. per lb.

Pharmaceutical and Fine Chemicals

BISMUTH SALTS.—Carbonate, 7s. 5s. per lb.; Citrate, 10s.; Nitrate (cryst), 5s. 2d.; Oxide, 11s. 7d.; Salicylate, 8s. 4d.; subchloride, 11s. 4d.; subgallate, 7s. 11d.; subnitrate, 6s. 7d.
QUININE SULPHATE.—1s. 11d. per oz.
AMMONIUM IODIDE.—10s. per lb.
IODINE RESUBLIMED.—7s. to 11s. per lb.
IODOFORM.—10s. 9d. to 13s. 7d. per lb.
POTASSIUM IODIDE.—8s. 3d. to 10s. 3d. per lb.
SODIUM IODIDE.—8s. 6d. to 10s. 6d. per lb.

Essential Oils

BERGAMOT.—7s. per lb.
CAMPHOR.—Brown, 65s. per cwt.; White, 95s.
CINNAMON.—Ceylon, 3s. 3d. per lb.
CASSIA.—80/85%, 4s. 3d. per lb.
CLOVE.—90/92%, English, 4s. 3d. per lb.
LEMON.—5s. per lb.
LEMONGRASS.—4s. per lb.
OTTO OF ROSES.—Anatolian, 35s. per oz.; Bulgarian, 50s.
PEPPERMINT.—Japanese, 5s. 3d. per lb.; Wayne County, 13s. 6d.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 9d. to 10d. per lb.; crude, 60's, 2s. 5d. to 2s. 6d. per gal.; 2% water 3s. 0½d. MANCHESTER: Crystals, 9d. per lb.; crude, 2s. 6d. to 2s. 7d. per gal. SCOTLAND: 60's, 1s. 7d. to 1s. 8d.
ACID, CRESYLIC.—90/100%, 1s. 6d. to 1s. 8d. per gal.; pale, 98%, 1s. 4d. to 1s. 5d.; pale 95%, 11d. to 11½d.; dark, 10d., all according to specification; refined, 1s. 8d. to 1s. 9d. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark, 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.
ANTHRACENE OIL.—Strained, 4½d. per gal.
BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor 1s. 4d. to 1s. 4½d.; 90%, 1s. 5d. to 1s. 6d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d. to 1s. 7½d.; 90%, 2s. 0½d. to 2s. 1½d.
CREOSOTE.—B.S.I. Specification standard, 3d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3d. to 3½d. f.o.r. North; 4d. to 4½d. London. MANCHESTER: 3d. to 4½d. SCOTLAND: Specification oils, 3½d. to 4d.; washed oil, 3½d. to 4d.; light, 3d. to 3½d.; heavy, 4½d. to 5d.
NAPHTHA.—Solvent, 90/160%, 1s. 4d. to 1s. 5d. per gal.; 95/160%, 1s. 8d.; 90/190%, 11d. to 1s. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Crude, Hot-Pressed, £6 1s. 3d. per ton. Flaked, £10 per ton. Purified crystals, £9 10s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—Medium soft, £3 15s. to £4 per ton. MANCHESTER: £4 f.o.b. LONDON: £3 15s. f.o.b. East Coast port for next season's shipment.
PYRIDINE.—90/140, 4s. 3d. per gal.; 90/180, 2s. to 2s. 6d. SCOTLAND: 90/160%, 4s. to 5s.; 90/220%, 1s. 9d. to 2s. naked.
REFINED COAL TAR.—SCOTLAND: 4d. per gal.
TOLUOL.—90%, 2s. 4d. per gal.; pure, 2s. 8d.
XYLOL.—Commercial, 2s. 2d. to 2s. 3d. per gal.; pure, 2s. 4d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The home price for delivery in 6-ton lots to consumer's nearest station during September and October is £6 15s. per ton. Export, £6 7s. 6d. per ton for September shipment f.o.b. U.K. ports in single bags.
NITRO-CHALK.—£7 5s. per ton in 6-ton lots to farmer's nearest station.
BRITISH NITRATE OF SODA.—September and October, £7 8s. 6d.; November, £7 11s.; December, £7 13s. 6d.; January, £7 16s.; February/June, £7 18s. 6d.
CALCIUM CYANAMIDE.—20.6% nitrogen, powdered and oiled, packed in paper lined 2-cwt. bags: September/October, £7 per ton; November, £7 1s.; December, £7 2s.; January, £7 3s.; February, £7 4s.; March/June, £7 5s.; carriage paid to any railway station in Great Britain in lots of 4 tons and over.
CHILEAN NITRATE OF SODA.—For delivery in 6-ton lots, carriage paid to buyer's station, September and October, £7 8s. 6d. per ton; November, £7 11s. 3d.; December, £7 14s.; January £7 16s. 9d.; February/June, £7 19s. 6d.
CONCENTRATED COMPLETE FERTILISERS.—£10 9s. 6d. to £11 per ton, according to percentage of constituents.

Latest Oil Prices

LONDON, September 6.—LINSEED OIL was steady. Spot, small quantities £23 15s., ex mill; Sept., £20 15s.; Sept.-Dec., £21; Jan.-April, £21 17s. 6d. per ton, naked. RAPE OIL was quiet. Crude, extracted, £28; technical refined, £29 10s., naked, ex wharf. COTTON OIL was slow. Egyptian crude, £20; refined common edible, £22 10s.; deodorised, £24 10s.; naked, ex mill. TURPENTINE was steady. American, spot, 49s. 6d. per cwt.

HULL.—LINSEED OIL, spot, quoted £21 10s. per ton; Sept., £21; Sept.-Dec., £21 7s. 6d.; Jan.-April, £21 17s. 6d. COTTON OIL.—Egyptian, crude, spot, £19 10s.; edible, refined, spot, £21 15s.; technical, spot, £21 15s.; deodorised, £23 15s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £18 5s., naked. GROUNDNUT OIL, extracted, spot, £23 10s.; deodorised, £27 10s. RAPE OIL, extracted, spot, £27; refined, £28 10s. SOYA OIL, extracted, spot, £21; deodorised, £24 per ton. COD OIL, 21s. per cwt., nominal. CASTOR OIL, pharmaceutical, 38s.; first, 33s.; second, 30s. per cwt. TURPENTINE, American spot, 52s. per cwt.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Holland.—An agent established at Amsterdam wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of gummed paper, art, and imitation art, and chrome paper. (Ref. No. 272.)

Roumania.—A firm in Bucharest wishes to represent British manufacturers of industrial chemicals, dyes, metal goods, bookbinding cloths. (Ref. No. 277.)

Company News

Amalgamated Zinc (de Bavay's).—A dividend at the rate of 5 per cent per annum is announced for the six months ended June 30 last.

British Glues and Chemicals, Ltd.—A half-year's dividend on the 8 per cent. cumulative participating preference shares has been declared, payable on October 5. The dividend is now in arrears from October 31, 1932.

United Indigo and Chemical Co., Ltd.—A dividend of 5 per cent., less tax, is announced on the ordinary shares for the year ended June 30, 1933. This is the first payment to be made on these shares since 1929-30, when 5 per cent. was distributed.

Kirklees, Ltd.—For the year to June 30 last, the trading profits amounted to £26,243, compared with £37,525 a year ago. After depreciation and other expenses have been met, the balance for the year is £2,012, which, added to £10,585 brought in, makes an available total of £12,597. Out of this £10,000 is transferred to reserve, leaving £2,597 to be carried forward.

Lovering China Clays, Ltd.—The accounts for the year ended March 31 show a total loss of £9,797, against £11,250 for 1931-32, after charging debenture interest (£14,838) and sinking fund allocation, etc. This increases the debit balance to be carried forward from £18,969 to £28,766. The report points out that trading operations covered only six months to September 30, 1932. As from October 1, 1932, the operating assets of the company were amalgamated with those of English China Clays, Ltd., and H. D. Pochin and Co.

Imperial Chemical Industries, Ltd.—The directors have declared an interim dividend in respect of the current trading year of 2½ per cent. actual, on the £43,589,605 of issued ordinary capital of the company. This dividend will be payable (less tax at 4s. 8½d. in the £, being United Kingdom tax at 5s., less Dominion tax relief at 3½d. in the £) on December 1, to shareholders on the register on October 14. The dividend is at the same rate as last year's interim, which was followed by a final of 3½ per cent., making 6 per cent. for the twelve months, against 4½ per cent. in 1931.

New Companies Registered

Black, Taylor & Cowell, Ltd., 141a Oldham Road, Manchester. Registered August 30. Nominal capital £500 in £1 shares. Manufacturers of and dealers in soaps, perfumery makers, chemical merchants, manufacturing chemists, oil and colourmen, etc. Directors: D. Black, "Acresfield," Heybridge Lane, Prestbury, Ches.; J. Taylor, and W. Cowell.

City Soap Works, Ltd., 14 Father Matthew Quay, Cork. Nominal capital £3,500 in £1 shares. Soap boilers, manufacturers of and dealers in soap and candles of all kinds, and all articles and substances used in or for the purpose of manufacturing soaps and candles, and all waste or by-products, and substances resulting from or in the course of the manufacture of soap and candles, manufacturers of and dealers in starch, water-softeners, soda and all kinds of laundry materials, etc. Subscribers: S. Macurcain, Camden House, Camden Quay, Cork, and Albert F. Hawke.

"Fort" Paints and Compositions Co., Ltd., 64 Waldeck Road, Chiswick. Registered August 28. Nominal capital £1,000 in £1 shares. To acquire the business of paint manufacturers carried on by the Hewitt Construction Synd, Ltd., and the trade mark "Fort." Subscribers: A. Kagan, 51 Park Drive, Gunnersbury Park, W.3, and F. G. Kelshaw, 3 Crown Court, E.C.2. A. Kagan is permanent governing director.

Metal Colours (Slough), Ltd., 75 Victoria Street, S.W.1. Registered August 28. Nominal capital £100 in £1 shares. To acquire the business of manufacturers of metal colours carried on by R. T. P. Treckham and Graham and Bohn, Ltd., at Trading Estate, Slough. Directors: Bohn, 2 Cromwell Gardens, R. T. P. Treckham, C. A. Parker and W. J. Maskey.

Palmer Paints, Ltd. Registered September 4. Nominal capital £1,000 in £1 shares. Manufacturers of and dealers in paints, colours, varnishes, lacquers (transparent or pigmented) cellulose products and solvents, bituminous paints, enamels, etc. Subscribers: S. G. Palmer, 12 Lownds' Avenue, Bromley, Kent; and J. F. Hudson.

Trade News

Grinding and Screening Plant Contracts

MINING and Industrial Equipment, Ltd., report the following among recent orders received: England: 60 in. by 36 in. Hardinge ball mill for mulling abrasive grains; two 3 ft. by 5 ft. type 31, Hummer electric screens for screening bone charcoal; 3 ft. by 5 ft. Hummer electric screen for screening partly ground cement clinker; Ro-Tap testing sieve shakers for laboratory testing. Wales: 5 ft. by 36 in. Hardinge ball mill for grinding ore. Italy: 3 ft. by 18 in. Hardinge ball mill for grinding pyritic ore. Cyprus: Two 8 ft. by 60 in. Hardinge ball mills for grinding a heavy sulphide ore. West Africa: One 7 ft. by 48 in. Hardinge ball mill for grinding hard quartz.

Artesian Well Construction

SHAFT sinking and pumping is the subject of a new brochure produced by Le Grand, Sutcliff and Gell, Ltd. This firm first came into existence as artesian well drilling contractors. With up-to-date plant and machinery they are favourably placed for carrying out complete contracts for water supplies from underground sources, including shaft sinking and the installation of pumping plant, pipe lines and reservoirs. Recent activities of the firm are detailed in this brochure, including the sinking of a 6 ft. well shaft, 300 ft. deep, carried out at the Wealdstone Works of Kodak, Ltd.

Import Duty Changes

Aluminium Sulphate, Alums and Lactose

THE Treasury, on August 30, issued a new Order under the Import Duties Act, increasing the Customs duties as from September 5 in respect of the following:—

Aluminium sulphate, ammonia alum, soda alum and potash alum	£2 a ton.
Aluminium hydrate	£3 a ton.
Lactose	3d. per lb.

In regard to aluminium sulphate, ammonia alum, soda alum, and potash alum, the existing import duty of 20 per cent., *ad valorem* is replaced by specific duties of £2 a ton, and, in the case of aluminium hydrate, £3 a ton. The output of aluminium sulphate is considerably less than the productive capacity in this country and importations are increasing. The prices at which Continental aluminium sulphate is exported to this country as compared with the domestic prices in the countries of origin lead the Committee to the conclusion that the duty should be chargeable by weight rather than on an *ad valorem* basis. Aluminium sulphate is principally used in the manufacture of paper, and the moderate increase made in the duty will have a negligible effect upon the production cost of paper. The uses of the alums are generally similar to those of aluminium sulphate, but they are preferred for certain high-grade processes. Aluminium hydrate is largely used in the manufacture of aluminium sulphate, and any protection afforded to the latter could be readily circumvented by the importation of hydrate. The supply of British hydrate is sufficient both in quantity and quality for the production in this country of all the sulphate that is required, and the Committee have received an assurance that supplies will be forthcoming to all who require them at a price that will be unaffected by any import duty that may be imposed.

The recently published report of the Reorganisation Commission for Milk states that "the pressure on the market of lactose is so great that the prices obtainable little more than cover the costs of manufacture; that the manufacture of cheese would be assisted indirectly if the utilisation of the by-product (whey) were made profitable," and proposes that measures should be taken to deal with the position so far as it is affected by heavy importations at progressively declining prices. Having regard to these conclusions, the Advisory Committee has recommended the increase of the duty to 3d. a lb., which it is satisfied will not prejudice the interests of the consumers.

New Chemical Trade Marks

Compiled from official sources by Gee and Co., Patent and Trade Mark Agents, 51-52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to September 30, 1933.

Caluux. 540,824. Class 2. Chemical substances used for agricultural, horticultural, veterinary, and sanitary purposes. I.C.I. (Lime), Ltd., Royal Exchange Buildings, Spring Gardens, Buxton. April 19, 1933. (By consent).

Stevia. 541,782. Class 4. Raw, or partly prepared, vegetable, animal and mineral substances used in manufactures, not included in other classes. Steve's Emulsions, Ltd., St. Stephen's House, Victoria Embankment, Westminster, London, S.W.1. May 25, 1933. (By consent).

From Week to Week

MR. O. AVISON, Market Street, Huddersfield, was appointed receiver and manager, on August 28, of Mallinson's Chemicals, Ltd., under powers contained in debenture dated August 30, 1932.

THE OIL AND COLOUR CHEMISTS' ASSOCIATION programme for the 1933-1934 session has been announced. The first meeting in London will be held at the Palace Hotel, Bloomsbury Street, on October 12, and the Manchester session opens on the following day.

THE WIDOW OF THE LATE LORD TRENT has ceded a plot of land facing Bouley Bay, Jersey, on the western short of the Bay of St. Brelade, as a site for the re-interment of Lord Trent, who had expressed a wish to be buried overlooking the sea. The grave will be hewn out of solid rock.

DR. H. P. STEVENS, the well-known analytical and consulting chemist, states that as from January 1 last he has taken into partnership his son, Mr. W. H. Stevens. Father and son will carry on business at their laboratories at 15 Borough High Street, London, S.E.1, under the title of Henry P. Stevens and Son.

IMPERIAL CHEMICAL INDUSTRIES, LTD., is contemplating the erection in the near future in London, where it already possesses a factory site, of a plant to manufacture building blocks and an improved type of plaster board. The use of the plaster board is rapidly increasing, so that the new plant in London should, it is thought, render considerable service to the consuming industries.

JUDGE FRANCIS ERNEST BRADLEY, judge of County Courts for the North-West Lancashire circuit, died on September 3, at Eastbourne, aged 71. He was the son of Nathaniel Bradley, a Manchester manufacturing and research chemist. He studied science at Manchester University, and worked for three years in his father's laboratory, patenting various processes, afterwards returning to the university as a law student.

ACCORDING TO REPORTS FROM DUBLIN a factory for the manufacture of munitions for the Irish Free State National Army is shortly to be established, probably at Fermoy or Ballincollig, County Cork. Cadets with degrees in chemistry and science will, it is understood, be drawn from the Universities Officers' Training Corps and offered commissions in the Ordnance Corps after special training.

A PARTY OF STUDENTS from the Denbighshire Technical Institute, Wrexham, returned last week from a tour of the Ruhr Valley in Germany, where they visited the leading chemical works and research laboratories. A tar distillation plant and synthetic ammonia works was inspected at Oberhausen, and at Leverkusen, near Cologne, the party saw over the I.G. Farbenindustrie works. Coal mines and engineering works were also visited.

SIR WILLIAM ARROL AND CO., LTD., have secured the main contract for the £45,000 extension scheme at the Scottish Dyes factory at Grangemouth. Work will begin during the next month. The scheme includes a four storey standardising building, with an adjoining warehouse of brick and steel, estimated at £40,000. A. and J. Main, builders, Glasgow, will have the construction of various other buildings, including time offices, laboratories, and a chemical store.

AMONG LATEST WILLS PROVED are the following:—Major George Belliss Parrott, Hagley Road, Edgbaston, a director and secretary of Belliss and Morcom, Ltd., £159,576 (net personalty £157,872); Kenneth Alan Macaulay, Walton House, Clent, Worcs., formerly managing director of Chance Bros. & Co., Ltd., glass manufacturers, Smethwick, £48,904 (net personalty £47,131); Walter Rickards, Stroud Green, managing director of Andrew G. Soutter and Co., Ltd., varnish manufacturers, £26,783 (net personalty £20,439).

FIRE BROKE OUT at the factory of Starch Products, Ltd., Slough, on September 1. The carpenters' shop was discovered by some workmen to be in flames at 8.30 p.m., and within a short time half the factory was a mass of flames. Although five brigades were called, it was impossible to do more than prevent the outbreak from spreading to surrounding premises. There was also the possibility of an explosion. With the exception of one part of the factory, which was isolated, the building was completely gutted.

LINCOLNSHIRE RIVERS FISHERY BOARD views with apprehension the subsidisation of units producing oil from coal. The board passed a resolution to this effect last Monday, stating that more harm would be done to fishing interests than had been caused by the beet sugar industry. The pollution of rivers by the draining off of such waste products as ammonia was almost inevitable, and a member of the board suggested that the Ministry of Agriculture should be approached with a recommendation that no subsidy should be granted to oil producers before a guarantee had been given that no pollution of fishing waterways should occur.

MR. R. MACLAURIN, of the Homesteads, Stirling, has been granted the patent rights for a process for producing ammonium bicarbonate containing small quantities of volatile substances which, when applied to soil, will kill insect pests.

A RESOLUTION FOR THE VOLUNTARY WINDING-UP of Onverwacht Platinum, Ltd., Johannesburg, is to be submitted at an extraordinary meeting of the company to be held after the ordinary meeting on October 26.

THE NORTH BRITISH ASSOCIATION OF GAS ENGINEERS held its 72nd annual meeting on September 7 in the Clark Town Hall, Paisley. During the morning session, Dr. F. S. Sinnatt, director of Fuel Research, London, delivered the William Young memorial lecture.

MR. F. E. HOOPER, who has completed 50 years' service with the Widnes firm of Thomas Vickers and Sons, Ltd., fertiliser manufacturers, was presented on August 29 with an inscribed silver salver. Mr. Hooper is the general manager, and has served under four successive generations of the Vickers family. The firm was established 97 years ago at Miles Platting, Manchester.

ONE OF THE BIGGEST BLASTS in the history of quarrying took place on September 6 at Raynes Quarry, Llysfaen, Colwyn Bay, where between 60,000 and 70,000 tons of limestone were dislodged. Hundreds of visitors were rather disappointed at the absence of any spectacle. They heard a dull thud and saw clouds of smoke and dust. The quarries are owned by Imperial Chemicals, Ltd.

CHEMICALS AND DRUGS imported into the Irish Free State during the month of July last were valued at £90,889 according to the official trade statistics just published by the Department of Industry and Commerce. This figure is lower by £10,881 than that of the corresponding period of last year. The value of chemical fertilisers (stated separately in the statistics) was slightly higher at £10,484, as compared with £6,780 in July, 1932.

APPLICATIONS FOR LICENCES under the Dyestuffs (Import Regulation) Act, 1920, during August totalled 575, of whoch 503 were from merchants or importers. To these should be added seven cases outstanding on July 31, making a total of 582. The The Dyestuffs Advisory Licensing Committee granted 563 licences and referred 13 applications to British makers of similar products, leaving six cases outstanding on August 31.

THE BRITISH SIDAC CO., which last year acquired the works at St. Helens of the Nuera Art Silk Co., expects the adaptation of the factory for the manufacture of wrapping papers to be complete in about three weeks' time. The machinery with which this patented process will be executed comes from Belgium, and Belgian workmen are installing it. When the works are fully established the company expects to provide employment for about 200 people.

THE DEATH OCCURRED SUDDENLY on August 29 of Mr. James Tennant, J.P., aged 83. He entered the chemical manufacturing firm of Charles Tennant and Co., Ltd., St. Rollox, Glasgow, early in life, and later became chairman and manager of Alexander Ferguson and Co., paint manufacturers. He was appointed a director of the United Alkali Co. when Ferguson's merged with that firm. Mr. Tennant lived at Fairlie, and travelled up to Glasgow daily almost until the time of his death. He leaves a widow and five married daughters.

THE SHARES OF BOOTS PURE DRUG CO., which were available as the result of the purchase in May last of the block of shares whereby control of the company passed to British hands, have now been disposed of and the conditions governing the marketing of these shares are therefore automatically terminated. It will be recalled that a pool was formed in the 1,000,000 shares purchase, and that it was originally intended that the pool should come to an end on August 4. At that date, however, rather more than half of the shares remained to be dealt with and arrangements were made for the continuation of the marketing plans for another three months.

FOR THE FIRST TIME in the history of the British gas industry, now in its 135th year, an official visit is being made to the Canadian and American gas industry. The president, Mr. F. P. Tarratt, and sixty members of the Institution of Gas Engineers were due to leave on Friday, September 8, to attend the 26th Canadian Gas Convention, in Ottawa, and the International Gas Conference and 15th American Gas Convention, at the Chicago Centennial International Exposition in Chicago. Apart from government, municipal, and university receptions, the members will visit, with a view to studying the manufacturing, distributing, utilising and selling methods of the gas undertakings, Montreal, Ottawa, Toronto, Hamilton, Niagara, Detroit, Chicago, Cleveland, Pittsburgh, Washington, Baltimore, Philadelphia, New York, and Boston and will return from Boston on October 8, arriving in Liverpool on October 16. Mr. A. C. Slaughter, editor of "The Gas World," published by Benn Brothers, Ltd., accompanies the party.

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